GAS JOURNAL

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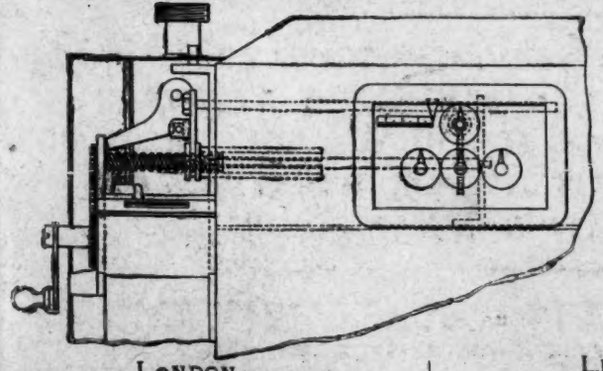

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VOL. CXLVII., No. 2930.] TUESDAY, JULY 8, 1919. [71ST YEAR.

EDITORIAL NOTES.

An Encouraging Reception at the Board of Trade.

THROUGHOUT the hard-pressed gas industry, there will be general gratification over the patient and sympathetic hearing and encouraging words which the President of the Board of Trade (Sir Auckland Geddes) gave to the deputation from the gas industry who were received by him last Friday. We are certain that the addresses [p. 87] by Mr. D. Milne Watson, as President of the National Gas Council, Sir Dugald Clerk, and Sir Arthur Duckham have not fallen on deaf ears, and that the industry may look to Sir Auckland and the Board to do what can be done, by legislative means, to redress its wrongs. There is no other way by which reparation can be made of the ill done to the industry by the war and concomitant circumstances; there is no other way by which the industry can be established in a position to render to the country all the service of which it is capable. That the industry has suffered grievously through the war and the issues of war, and through the effects of prior legislation based on economic conditions which no longer exist, and will never be restored, cannot be disputed. The facts are hard and plain, and may not be disposed of other than by change which will right wrongs, mitigate the harshness of conditions, and give the industry a fresh start under the country's altered circumstances. And no time must be lost in (as Mr. Milne Watson put it) assisting the industry to take its proper place among other great public utility services. The longer the delay, the worse things become.

The President was shown the importance of the industry in the country's domestic and industrial services; he was shown the important part it has taken during the war, and how essential it is not only in war but in peace as the provider of necessaries upon which the stability of other industries depend; he was shown the high position that it holds in promoting the conservation of coal and of its component parts which there are no other means than by carbonization of bringing to the service of man and the country. The gas industry must be restored to a healthy financial, technical, and commercial status; and this both justice and commonsense demand. But up to the present what has been done by the Government to render assistance to an industry precipitated, within a few years, by war and legislation combined, from success to a condition in which it can only struggle along with no hope of making progress other than by such a release from restrictions as will enable it to combat the new order of things? The Statutory Undertakings (Temporary Increase of Charges) Act was passed. It gave no relief, but merely stopped the total disintegration of the capital of the industry—nothing more. The result of this action of Parliament is seen in a shameful return to old investors, to a depreciation of the market value of the capital by 40 p.ct. and more, and to an utter incapacity of gas undertakings to raise money on reasonable terms while such conditions exist. No honest-minded man can pronounce the position a just one; no honest-minded man could applaud a Government that insisted on the retention of legislative conditions that would only tend to degrade still further, and finally extinguish an essential industry.

Then the Government has become positively saturated with mistaken notions—yet we are told they have taken the "best advice" possible—as to the position of the electricity industry in relation to economy and efficiency, and coal conservation. But the information that Mr. Milne Watson and Sir Dugald Clerk very fairly placed before Sir Auckland must have convinced him that the Government has been looking at the electricity question from a too narrow point of view and through rose-tinted spectacles, which have produced considerable misapprehension. The gas industry does not look upon the electricity industry with any enmity; but it does object to more credit in utility being given to it than is its rightful due, to the detriment of the older industry, whose known potentialities are greater than ever, given necessary conditions. It is no economy to produce an advantage in one direction if, by so doing, there are created disadvantages that will far outweigh the gain. That is what the Government are doing. There is no reason whatever why the position of the electricity industry should not be improved within the limits set by national expediency; there is equally no reason why the position of the gas industry should not also be improved within the limits set by national expediency and justice. The Government should legislate in connection with the coal-using industries that come under statutory control so that the very best use is made in the national interests of the coal resources. The prosperity of the country as a whole is of more consequence to the nation than the prosperity of electricity only.

The gas industry naturally desires to make progress; it cannot do this until, as Sir Arthur Duckham pointed out to the President of the Board, its position is rehabilitated. It wants to render the best possible service to the country; and for this, given the necessary elasticity, it is well fitted. In regard to finance, it asks a fair reward for its invested capital; for only with such reward will the industry commend itself to fresh investment. It does not beg for capital assistance to the tune of 20 millions sterling or any other sum, nor does it ask the Government to guarantee the interest on 25 millions of fresh capital. It wants nothing of the kind. It will be content to obtain capital on its own merit and credit with a sound financial basis re-established, subject further to the elasticity recommended by the Board of Fuel Research, with the necessary modifications of certain recommendations.

Sir Auckland Geddes is no partizan; his scientific knowledge is of immense value to the gas industry. He realizes to the full its importance; and we feel convinced he sees the industry is being held back by conditions unfair and obstructive. There is a feeling of confidence that, after the appeal that has been made to him direct, and the facts that have been placed before him, the gas industry will find Sir Auckland moving with the view to the reinstatement of the industry in financial security, and to the opening of the way to more extended and beneficial service. There are men in the Government now who are not bound by precedent, but are capable of moving with, and legislating for, the times.

Calorific Value Wartime Standard Continued.

THE wartime gas standard of 450 B.Th.U. is to continue—at any rate, until the end of October. This is the wise decision that the Board of Trade has come to upon the representations of the Coal Controller, who sees no chance of accumulating sufficient reserves of coal for winter, if there is any interference with the utilization of the processes of manufacturing gas which make for coal economy. And, very properly, gas consumers will have greater liberty and comfort than they had last winter, under the rationing scheme, in being able to use 18,750 c.ft. of gas as the equivalent of a ton of coal for heating purposes. The seriousness of the coal position, however, is accentuated by the necessity of continuing in the newly published Rationing Order most of the restraining conditions which appeared in the Order that was issued last year—save in respect of the equivalents. The Board of Trade promise to carefully review the position of gas undertakings in regard to standards before the end of October next. The gas industry may be

satisfied that the Board will give very serious attention to the matter from both the industry's and the national points of view. But we would point out that, at this period of the year, the Coal Controller acknowledges the difficulty of accumulating stocks; and there will not be much chance of doing anything big in this way before the end of October, with all the claims upon the collieries, and the shortage of output. By October, the demand for bituminous coal will be on the rise to winter's peak, and so will be the demand upon gas undertakings, which follows more and more the erratic course of climatic conditions. Therefore there is little likelihood of conditions being any easier in October than now, though we sincerely hope they will be. But before the end of October, some new change may be on the way to giving the industry new operating conditions and ground, which will mean for it liberty, and for the consumers and country better service and a good contribution to economy.

An Object Lesson in Thoroughness.

The South Metropolitan Gas Company may not spend much on the ornamentation of their works. It would be against the best traditions of the Company's engineers and administrators to do so; and the ancient policy in this respect still obtains, to the benefit of the capital account. But, of course, the engineers of the Company are not averse to substantial structure. They do not believe in flimsy erections; but they do not practise the spending of money in excess of requirement and durability. There are, however, other points about the present-day policy of the Company to which more direct attention may be called, and which have their lessons. Of these the members of the Southern District Association of Gas Engineers and Managers saw much on their visit to the Old Kent Road works last Thursday. It was a special visit, conceived and arranged for by Dr. Carpenter, the Chairman of the Company, in view of the fact that the President of the Association this year—Mr. Frank Livesey—bears a name which is deeply rooted in the history of the development of the Company, and is honoured not only throughout the British gas industry, but throughout the gas industry of the world. We will not dwell upon the cause of the visit, because there is an article elsewhere which will explain and describe much to those who read it from beginning to end.

From that article it will be gathered that there are two things which impressed themselves more than all else upon the visitors. The first is the thorough organization, not only in the highways of operation, but in the by-ways of the Company's business from manufacture throughout to the trading department, even to the very appliances by which the gas is consumed. The same thorough organization can be applied to the operations from "A" to "Z" of every gas undertaking in the United Kingdom, within the limits of their power; and thorough organization is a prime developer of power. It is easy enough to have bad organization; it shows real management to have good organization. In the case of the South Metropolitan Gas Company, part of the organization consists of standardized methods, and these methods produce standard products, under strict chemical supervision. And this is work upon which Dr. Carpenter has brought to bear a large amount of his individuality and leanings in thought and interest. What the visitors saw in the laboratories at the Old Kent Road works was something over which many marvelled. They saw there refinement to the smallest detail in the work of control and research, in which (as Mr. Frank Livesey expressed it in his speech at the luncheon) the twin sciences of chemistry and physics have been brought to bear upon the work and potentialities of the gas industry. Such work to such an extent and to such a degree of exactitude could not be carried on by any gas undertaking except one in an influential position, and with considerable resources.

And it is only right that large and influential Industrial concerns should, from their very position, be in the van in research work, in order to supplement what is being done by co-operative effort, and not only for the advantage of the individual concern, but for the general benefit of the industry to which those undertakings stand, or should stand, in the relation of leaders. Research, engaged in with the express view to discovery, is something that does not always produce immediate result; the line taken may prove to be absolutely abortive. But without exploration one cannot know the result in store. Often the expected does not result; the unexpected does. New light may be thrown on dark places; and fresh suggestion may eventually bear fruit. On the other hand, good result may come quickly, or with perseverance after a time. Research with an aim is something speculative, but highly necessary to progress. This has been found by the South Metropolitan Company; and those who witnessed the work that is proceeding in both the physical and chemical departments left them with a fair confidence that, in one way or another, there would be from that very work developments in efficiency and economy—developments, for example, in the character of gas supplied, developments in the refining and utilization of the various secondary products resulting from coal carbonization (possibly a commercially practicable means may be found for readily recovering some of the nitrogen from coke), and developments in the efficiency of gas-fire fuel.

As we say, research on such magnificent scale as at Old Kent Road cannot be carried on by many gas undertakings; but there is one lesson which all undertakings can learn—that is the value of control by fairly simple chemical means. Now Dr. Carpenter, however instrumental he has been in applying high standards of working to the South Metropolitan Gas Company, does not suggest that his chosen standards, quantitative or qualitative, should be applied to all gas undertakings. Circumstances alter cases. But he does, as we understand him, hold that the best standards of working should be adopted in the circumstances of every gas undertaking; and that then these standards should be constantly maintained (until good reason is shown for a change) by, where applicable, chemical control which, if carefully and methodically pursued, can be quite simple. This means that every gas manager, if he cannot afford chemical assistance, should himself add an elementary knowledge of chemistry to his other qualifications. With the South Metropolitan Company, research has set the standards, research has conditioned the controlling tests, which have been developed to a high degree of refinement, to the end that (with the methods, also the products of research, applied to manufacture) gas of an approximate calorific value is regularly maintained, impurities are kept to a minimum, and inerts can be guaranteed within a negligible percentage variation. The same with the secondary products. A dry neutral sulphate of ammonia of (say) 25 p.ct. ammonia content is an exemplification; and farmers, who require efficiency in application and result, would be well advised to have no other. But we will not labour the matter. The information elsewhere will fill in the many blanks of this article; and not only gas managers but manufacturers of gas appliances will be interested in the particulars given as to the construction and testing of the "Metro" range of burners and appliances, in their latest forms and varied types, for both domestic and industrial purposes. Through all the work, thoroughness is seen; and thoroughness is a quality which is not the property of any one concern, but is open and applicable to all, where the will to apply exists.

Will Colliery Nationalization Produce Smoother Working and Cheaper Supplies?

Men and industries temporarily breathed a little more freely at the beginning of last week after a deputation had waited on Mr. Bonar Law, in connection with the Ways and Communications Bill, and had obtained an assurance that he could not see that the Bill necessarily led either directly or indirectly to nationalization, and that neither he, nor the Prime Minister, nor any other member of the Government was committed to the nationalization of the coal industry. The Transport Bill does not, in his opinion, entail nationalization even of the railways; it aims only at a co-ordination of forces and stoppage of wasteful competition. The men composing the deputation would not have been there at all unless their examination of the Transport Bill had led them to a view diametrically opposite to that adopted by the Leader of the House of Commons; nor would there have been such an outcry from all quarters of the country hostile to nationalization if intelligent men had not seen the danger. However, they have been told by Mr. Bonar Law that they are mistaken, and that the Government have not made up their minds. The Government are now apparently getting frightened over the storm that is brewing, and which no indefinite words by any member of the Government will permanently allay, though it is satisfactory up to a point to have an assurance that the Government are not yet fully pledged one way or the other. It will not do to let Mr. Bonar Law's words have a soporific effect. Remembered

now is the statement Mr. Churchill made months ago as to the nationalization of the railways; and recollection compasses the promises of Mr. Lloyd George to the railwaymen regarding nationalization. The consideration of the question of nationalization was also one of the main objects of the appointment of the Coal Commission. When once the Government put their feet on the road to such a political revolution—no matter how firm present resolution may be as to only going part of the way, and then making a dead stop—it will be difficult for them to resist the forces that will be brought to bear to urge them forward along the road, and at an accelerated speed. They have shown little resistance up to the present to those forces which have had fresh inspiration and infusion of power from the report that Mr. Justice Sankey frankly made advocating nationalization of the coal mines as being something superior, both theoretically and practically, to the conditions at present existing or that could otherwise be devised.

As was remarked last week, Mr. Justice Sankey stands, in company with a few men who hold dear the doctrines of syndicalism and a couple of theorists of a very pronounced order, in opposition to a mass of men possessing the keenest intellects in the country on all questions affecting industry and trading. Mr. Justice Sankey seems to have considered the case for nationalization from two points of view only—whether the present conditions on which the coal industry is worked are sufficient, and whether under these conditions there can be any improvement in the relations between the colliery owners and the miners which would result in benefit to the country. He avows that the prevailing conditions are both unsatisfactory and insufficient; and obviously he cannot conceive of any other plan than nationalization that will suit the industry. He knows nothing positive regarding the effects of nationalization; he knows nothing as to whether or not it would be better for the community; he knows nothing as to whether the miners will work more advantageously for State employers than for private employers. He has only a floating hope that they will. "Many of the "workers," he writes, "think they are working for the "capitalist; and a strike becomes a contest between labour "and capital. This is much less likely to apply with the "State as owner; and there is fair reason to expect that the "relationship between labour and the community will be "an improvement upon the relationship between labour "and capital in the coalfields." Where has Mr. Justice Sankey found that fair reason?

Most other sentient beings see "fair reason" to believe that the relationship will not improve, but will become more strained. They find ample grounds for this belief in the past; they find it in the report of Mr. Justice Sankey himself, and in that of the miners' representatives; they find it in the resolutions of recent labour conferences. The extremists among the miners' representatives are not going to stop at nationalization; they are out for syndicalism. They are aiming for the control of the industry not by the State, but by the miners themselves in their own, and not the community's, interests. This is one of the dangers the Government have to face; and they will find that the miners will not be content until they attain their objective. This is no idle fancy on our part. In Mr. Justice Sankey's report, he says: "They have now, in many cases, and to an "ever-increasing extent, a higher ambition for taking their "due share and interest in the direction of the industry, to "the success of which they, too, are contributing." This is politely put. The learned Judge sees nothing but a justifiable and very human ambition; no question of any ulterior motive appears to have crossed his mind. His recommendation is that on the Local Mining Councils of ten members the miners shall have four representatives, and on the District Mining Councils, consisting of twelve members, they shall also have four representatives. The National Mining Council would be composed of members drawn from the District Mining Councils. In the report of the miners' representatives, they say: "We suggest that, with a view "to securing the cordial co-operation of the workers in the "success of the industry, it is necessary to provide for a "fuller representation of the workers on the District and "National Councils." This shows what the miners' representatives are out for. What they will be content with, and nothing less, is a preponderating voting power on both the District and National Mining Councils. This means, under the guise of nationalization, the committing of the industry and the nation at large to the tender mercies of the workers within the industry; and so we arrive, with this development, at syndicalism. The nationalization of coal is a matter apart; but if there is to be true nationalization of the collieries, which most people devoutly hope there will not be (though other changes in the industry are admittedly desirable), then there must be management in the way the nation considers best.

On what grounds (this is a question in which consumers who want smoother working and cheaper supplies are very deeply concerned) does Mr. Justice Sankey think that strikes and stoppages of output are less likely under national than private control of collieries? We have seen the admission of the miners' representatives that "cordial co-operation" is only to be secured by a larger voting power for the miners than he suggests on the administrative bodies. Strikes and stoppages of output will not, therefore, be less likely unless the miners obtain such power as will render strikes unnecessary, because it will assure them of receiving all they want. The Chairman himself anticipates trouble when he suggests that to cease work should be made impossible until questions of dispute have been before the District Mining Council and the National Mining Council, and there has been failure to settle. But the miners' representatives will have none of this. They see the chance of these proposals being used to impose by law upon the workers a particular form of contract without their consent—"an innovation to which "we [the miners' representatives] think it will be difficult "to gain agreement." Then, on top of this, we have the resolutions at recent conferences regarding the right to take direct action in political matters—that is to say, political matters (such as this nationalization question) in which certain unions consider their decisions should ride superior to those of the constitutionally elected representatives of the whole community. These are the people from whom Mr. Justice Sankey has, he thinks, "fair reason" for expecting better relationships with the community, and who, "to an "ever-increasing extent," have higher ambitions for taking part in the direction of the coal industry. We are afraid that the Chairman has not taken full measure of either the men or the situation. Nationalization is not going to make new men of the miners, speaking of them collectively and not individually, for even miners are not all alike in their views as to how much is due to themselves and how much is due from them to the community. Nor are abstract considerations such as are found plentifully sprinkled through Mr. Justice Sankey's report of much avail when opposed to the concrete facts of which the country has had considerable experience in the past. Therefore his pious aspirations as to the maintaining of output at a level of at least 250 million tons, and his appeal to the men's honour, do not move us in any way to think better things. We are confident that this whole matter is being engineered by a few extremist leaders for even more than is compassed by Mr. Justice Sankey's report, and that the arrogance that has been displayed is due not to the fact that the miners individually want nationalization or syndicalism, but to the knowledge that there is a large majority of the miners who will do the bidding of their leaders. Now is the time for the Government to govern, in the name of the whole community, and not be themselves governed by a section of the community.

National Association of Technical Gas Officials.

Step by step an advance is being made towards the goal of having a National Association of Technical Gas Officials, the work of which would be directed towards improving the status and remuneration of technical gas men, and protecting the interests of those whose conditions stand in need of such influence as an organization of the kind could yield. It was made quite clear at the meeting held under the auspices of the Institution of Gas Engineers towards the end of May that the Institution itself was unfitted by its constitution and powers to undertake work such as that in contemplation; but that there is no reason why an auxiliary organization of technical officials should not be formed, which could take counsel with the Institution in operating to level-up the valleys in the status and remuneration curves applying to technical gas workers. It is now or never. It is something it is very necessary should be done if the gas profession and its technical work are to be raised to a more dignified level, and an adequate reward be generally given.

Translate Enthusiasm into Action.

There was great enthusiasm over the subject at the meeting in May. Good support and deep sympathy were shown. Reso-

lutions were passed agreeing that the time has arrived for the formation of a Registered National Association of Gas Officials, and that the delegates to the Birmingham conferences should be appointed an Interim Committee, with power to add to their number. Power was also conferred on them to incur needful initial expenses in the forming of the National Association. The sympathy, support, and authorization it is now desired should be translated into more material form. A circular-letter has been issued; and recipients should without delay make on the form supplied the declaration of their sympathy, and just mention the sum they are prepared to guarantee towards the preliminary expenses —not exceeding a guinea. A number of prominent gas engineers whom such an organization will not benefit have promised to join; and so from the strength of their position hold out a helping hand to those less fortunate than themselves. This is the spirit that is required all through the profession; and not a recumbent aloofness through personal satisfaction. Let each engineer in a strong and satisfactory position consider what he would like the other man to do in this matter if positions were reversed. It is obvious the Committee (members of which are all men who have been appointed by the different District Associations and Institutions) must have the support of the majority of the technical members of the industry before they proceed further with the matter. In fact, it is recognized that success can only be hoped-for by roping-in almost all technical men in the industry. Therefore, let every circular-letter that has been sent out be filled up, pledging the necessary support, and that at once.

A Big Order from the Coal Mines Department.

The Coal Mines Department appears to have taken on a big job. We do not know whether a circular-letter before us has been received by all gas engineers and managers. But if it has, and they all comply, the Coal Mines Department, we should imagine, will soon be "snowed under" by 2-lb. samples of coal. They are asking for 2-lb. samples, separately packed, of each kind of coal carbonized in gas-works; and they want each engineer to see that the 2 lbs. fairly represent the bulk. Some gas-works have supplies from several collieries; and from our experience of present-day coals delivered to certain gas-works, we should defy anyone to take a fair "average" 2-lb. sample from them. With coal from the same colliery, different truck loads often differ in quality in these times. To get a fair average result from coals supplied to-day, it would be better to carbonize 2-ton samples, than the small laboratory sample. The Coal Mines Department wants each sample marked for purposes of identification, the name of each colliery, information as to whether the coal is supplied screened or unscreened, and prompt attention. Gas engineers will bless the Department; and if the demand has been universally made, we wonder when the several thousand 2-lb. samples will have been dealt with, and the results of the investigation disclosed. However, we hope something beneficial will come out of this move; but we have our doubts.

Ethylene and Power Alcohol.

The report of the Inter-Departmental Committee to the Petroleum Executive on various matters concerning the production and utilization of alcohol for power purposes is a pregnant document. It is an old subject with a new interest, because the people of this country, or a large section of them, have awakened to the fact that, with the developments of locomotion in which liquid fuel is necessary, this country must make the most of its own resources. The Inter-Departmental Committee have been considering the question of alcohol production, and its mixture, for power purposes, with benzol, ether, and other suitable vapours. The Committee have, during their investigation, received evidence as to the extraction of ethylene from coal gas and coke-oven gas. From his large experience as Director-General of Explosives Supplies, Lord Moulton gave to the Committee freely when they were considering the probable future output of ethylene and its synthetic conversion into ethyl-alcohol, together with the estimated costs of the process involved. Witnesses, too, have come along, and testified to there being a large potential source of power alcohol in this country; but further investigations are necessary, particularly as regards the conversion of ethylene into alcohol, before definite figures as to quantities and prices can be given. However the Committee think that, within the United Kingdom, the prospects of a large production of alcohol from the vegetable world are comparatively small, but that the synthetic production of alcohol is highly promising, especially from coal gas and coke-oven gas. The gas industry, one way and the other, looks like having a pretty close connection with the motor industry. Further information and developments must be awaited before saying more.

The Position of Nitrate of Soda.

The offer made to users of nitrate of soda through the medium of a circular-letter issued by the Board of Agriculture last December (which offer was subsequently withdrawn) is the subject of some criticism in the half-yearly report of Messrs. W. Montgomery & Co., Ltd., who say that had the Board desired to make an offer without selling, they could not have improved on the phraseology which they adopted. Apart from any effect which this step may have had, the market during the past six months has, they state, been very lifeless. Indeed, aside from Government sales to neutral countries, it might be said to have been paralyzed. With regard to the current half year, they hazard the opinion that for the United Kingdom there will be, with Government stocks, a sufficiency. A great demand for fertilizers next season is with good reason regarded as tolerably certain, owing to the large extent of land which it has been impossible to cultivate during the years of warfare. Producers will thus soon be relieved of the heavy burden of stock they are carrying; and for at least the next two or three years, Messrs. Montgomery do not think they need have great cause for anxiety from competitive products. Reporting upon the same subject, Mr. Thomson Aikman, Jun., says the past year has been a satisfactory one for nitrate producers; and the large profits earned by most of them have so strengthened their financial position as to enable them to pass through the present period of inactivity without anxiety. The poor demand in the United Kingdom he ascribes to the "artificially low price" fixed by the Government for the sale of sulphate of ammonia for home consumption, and the prohibition of export, except in very limited quantities.

A Visit to German Chemical Plants.

Certain American officers who have since active hostilities ceased been inspecting German chemical plants, have related their experience in the pages of the "Journal of Industrial and Engineering Chemistry." Major Theodore W. Sill was one who, as a member of the Inter-Allied Commission, visited most of the chief plants in the various occupied areas of Germany which were devoted to the manufacture of dyestuffs and standard chemicals. Owing, he says, to the great foresight and efficiency of the German pre-war system—that is, efficiency from a military standpoint in particular—all their man-power was registered and so classified that when the call to battle came they kept a large proportion of their trained workmen within these plants. Consequently, they still have the majority of them ready to take part in a new battle for commercial supremacy. People should clearly realize that this important portion of Germany's industries is not crippled, but intact. At present the only things they lack are raw materials and coal. One of the works inspected was the Badische Anilin und Soda Fabrik, at Ludwigshafen, whose plant occupies about 16,000 men. At the moment, they have a large stock of dyestuffs on hand, "ready to turn loose on the markets when permission is granted." Elsewhere, at Oppau, there was seen operating on a practical basis the Haber process for ammonia production. Everything has been worked out to a scale of upwards of 100,000 tons of ammonia per year. The Germans have also another plant, a duplicate of this, which is operating in the unoccupied part of the country. Mention is made of the fact that the Germans have a clever method of building their water-towers around the power-house chimneys or stacks, thus utilizing the waste heat and keeping their water from freezing. At one place there was seen an excellent automatic nitration system, based upon the alternate filling and refilling of a small tank with a measured quantity of water, which in turn was connected with valves releasing definite amounts of acid and benzol.

A Recent Will.—Estate to the gross value of £10,493 was left by Mr. T. Ormiston Paterson, formerly of Birkenhead, who died some months ago at Weston-super-Mare.

Calorific Standard Act.—The Board of Trade have received applications under the Gas (Standard of Calorific Power) Act from the Canterbury Gas and Water Company and from the Harpenden District Gas Company. An Order has been made by the Board in favour of the East Grinstead Gas and Water Company.

PEACE MESSAGES.

FROM MR. D. MILNE WATSON, LORD MOULTON, AND SIR ARTHUR DUCKHAM.

Mr. MILNE WATSON writes: "The five years that have passed have entirely altered the face of the industrial world; and it is essential that every industry should be prepared to adapt itself to the new conditions.

"The gas industry is a national one, and is essential to the welfare of the nation equally now in peace as it was during the war. How is it to fulfil its destiny? It can only do so by sinking all personal differences, by uniting its forces, and by endeavouring to give the best service to the country as a whole. If it does, it need have no fear of the future.

"If, in the gas industry, both employers and employed determine to work together for the common good, if it can be said of us, as it was said of the Jews in their reconstruction, that 'the people had a mind to work,' there is no doubt that, as theirs, our efforts will be crowned with success."

Lord MOULTON'S message is: "The last five years have demonstrated the value of the gas industry of the nation in time of war; and it lies upon it now to show that it is equally as efficient in times of peace. It will succeed in doing this if it remembers and follows the lessons it has learnt in war-time."

Sir ARTHUR DUCKHAM, K.C.B., writes: The future of industry lies in the conservation of fuel. The gas industry embodies the basis of conservation—that is, the resolving of coal into its constituents, in order that the whole of the heat may be used to the best advantage. We have been taught to think Imperially; the gas industry must now think "Thermally."

OBITUARY.

LORD RAYLEIGH.

Lord Rayleigh, O.M., who died on Monday of last week (at Witham), in his 78th year, will always be remembered in connection with the discovery of argon; while gas men in particular have also for many years known him as the Chief Gas Examiner of the Metropolis. He was Chairman of the Departmental Committee appointed by the Board of Trade in 1904 to inquire into, and report upon, "the statutory requirements relating to the illuminating power and purity of the gas supplied by the Metropolis Gas Companies, and as to the methods now adopted for testing the same, and whether any alteration is desirable in such requirements or methods, and, if so, whether any consequential alteration should be made in the standard price of gas."

Among his many other activities, Lord Rayleigh was Chairman of the Treasury Committee who recommended the establishment of the National Physical Laboratory, and after its foundation became Chairman of the Executive Committee. Thirty-five years ago, he was President of the British Association, when the meeting was held in Montreal, and shortly after this was elected one of the Secretaries of the Royal Society, and Professor of Natural Philosophy at the Royal Institution. In 1905, he was President of the Royal Society, and three years afterwards was installed as Chancellor of the University of Cambridge, in succession to the late Duke of Devonshire. When recording the latter event in the pages of the "JOURNAL," it was stated that it had occurred to several of Lord Rayleigh's friends that some mode of expression should be afforded to the gratification of the scientific world on his election as Chancellor, "which would at the same time serve as a mark of recognition of the great obligations to his example and influence under which British science had rested for many years. They had therefore arranged to offer to the University a fund large enough to provide an annual award, in such manner as Lord Rayleigh might select, to be associated with the name of the Chancellor in those branches of knowledge in which he is pre-eminent."

It was in his Presidential address to a Section of the British Association in 1882 that Lord Rayleigh pointed to the need for a re-determination of the density of the principal gaseous elements, which work in course of years led him to the discovery of the new element, since known as argon.

B. SCHIELDROP.

The sad intimation has been received by cablegram of the death, on June 29, of Mr. B. Schieldrop, Gas Engineer at Bergen, Norway, who numbered many Englishmen among his large circle of friends. At the Liverpool meeting of the Institution of Gas Engineers which immediately preceded the war, he read a paper on "Some Special Features in Gas-Works Practice from Norway;" and it was at one time hoped that the members would have had the pleasure of another communication from him this year.

A new method of carbonization had been patented by Messrs. Helgeby, Schieldrop, and Bull, an installation of which is being constructed at Bergen; and Mr. Schieldrop had desired to have it completed in time to give the results to English gas engineers at the recent Institution meeting. Sickness, however, intervened, together with other unexpected delays in construction; and the new retort is still awaiting test. It combines a joint production of water gas and coal gas on an entirely new principle, which embraces internal heating and combustion. Water gas, coal gas, or the two in combination, can be produced at will; so that either coke can be obtained, or the contents of the retort carbonized to clinker. Mr. Helgeby died last year; and the new loss leaves Mr. Bull, who is an eminent chemist in Norway, the sole survivor of the inventors.

Mr. Schieldrop was a man of many parts, and numbered among his accomplishments a thorough knowledge of some half-dozen languages. Before being appointed to Bergen, he had had a great deal of engineering experience in Europe and America.

Sir JOHN BRUNNER, Bart., died at Chertsey last week, from heart failure. He was Chairman of the great chemical firm of Brunner, Mond, and Co.; being thus identified with the Mond gas producer and the power gas movement generally.

The Bishop's Stortford, Harlow, and Epping Gas and Electric Company have lost a very old servant by the death on the 25th ult. of their Manager, Mr. J. W. PORTASS. Deceased, who was in his 65th year, had been at Bishop's Stortford close upon thirty years, previous to which he was for some time with the Sheffield Gas Company, and was then Manager for two years at Haverhill.

PERSONAL.

Mr. F. H. JAMES has been appointed Assistant Secretary of the Imperial Continental Gas Association. Mr. James is an Oxford man, and joined up in 1914. He held a commission as Captain in the Royal Scots; and, after being wounded and gassed, and declared unfit for further military duty, he took service with the Treasury, in the Assistant Secretary's Department, whence he comes to the Association with a high reputation.

Mr. JOHN WILSON, the Manager of the Motherwell Gas-Works, takes over (in addition) the management of the Wishaw Gas-Works; the extra salary for the duties at Wishaw being fixed at £150 yearly.

Among various changes that have recently had to be made in the *personnel* of the Coal Mines Department, we notice that Mr. FRANK PICK, the head of the Household Fuel and Lighting Branch, with whom so many readers have come in contact in connection with the rationing schemes, is now obliged, by reason of the increased work devolving upon him in his capacity as Commercial Manager of the Underground Railways, to relinquish his executive functions; but he has consented, at the Controller's request, to continue to advise upon the administration of the Branch. Mr. N. T. FORD, of the Board of Trade, has been appointed to be the executive head of the Household Fuel and Lighting Branch.

The Chesterfield Gas and Water Board have appointed Mr. H. DAVIES, Gas Engineer and Manager to the Brighouse Corporation, as their new Gas Engineer and Manager. Forty-two years of age, Mr. Davies was formerly Chief Assistant at Blackburn, and has also held the positions of Assistant Gas Engineer at Darwen and Colne. He received his training under the Runcorn Gas Company, and studied engineering and laboratory work at the Liverpool University.

The Clay Cross Gas Company have appointed Mr. HENRY ELLIOTT to be Manager of their Crich and Ambergate works. He has been in the service of the Clay Cross Company since boyhood, and succeeds Mr. W. H. HARRIS, who has resigned.

The Oldbury Urban District Council have increased by £110 per annum the salary of Mr. CHARLES H. CARDER, their Engineer and General Manager.

Gas Men and Invention.

In a paper dealing with the subject of governors, which he submitted at the annual convention of the Southern Gas Association of the United States, Mr. M. D. Dexter remarked that the only sources of information on the design of the various types of pressure-regulating devices now in use have been the bulletins of the various manufacturers, or the actual knowledge which has been acquired through experience in the use of pressure-controlling devices. He argued that it is typical of many industries to leave to manufacturing specialists to design improvements in the art, whereas the reverse should largely be the case. This is probably more the fact in the gas industry on account of its being such an old and, generally speaking, conservative business. If gas men studied more the principles of design, they could select apparatus to greater advantage, and have a clearer idea of operation, and, with a greater opportunity than the manufacturer of observing the operation of the apparatus, be in a better position to suggest improvements. A review of the files of gas journals in the eighties (or earlier) he considers indicates much greater inventiveness among gas men than is to be found at the present day. He asks if the advent of electricity damped some of the enthusiasm of gas men, or whether the absorption of gas companies into organizations where the electric end—such as light, power, and street railway interests—predominates, has any effect on the initiative of gas men. Attention is drawn by the author to the fact that a lead has already been taken by Southern gas men; and, as examples, he quotes the Congdon scrubber, the Maxon-Premix burner, and the Zeek automatic operation of water-gas sets.

GAS-TESTING FOR CALORIFIC POWER.

Wartime Standard Extended to October Next.

The National Gas Council forward for publication the following letter they received last Thursday from the Board of Trade.

June 30, 1919.

Sir,—With reference to your letter of the 2nd of June, I am directed by the Board of Trade to state that a letter in the following terms has been addressed by the Board of Trade to the Association of Municipal Corporations, the Urban District Councils' Association, the Corporation of London, and the London County Council:

Sir,—I am directed by the Board of Trade to advert to their announcement of the 17th of December, 1918, in which they suggested to the representatives of the local authorities responsible for the testing of gas throughout the country, that they should refrain from taking proceedings against any of the gas undertakings in respect of deficiencies of calorific power so long as the calorific power did not fall below 450 B.Th.U., and so long as the proportion of inert constituents in the gas was not excessive.

The Board of Trade did not at that time contemplate that this relaxation of statutory requirements should continue beyond the end of the present month; but they now learn from the Coal Controller that the shortage of coal, combined with the increasing demand for gas, are making it extremely difficult to accumulate the reserve stock of coal that will be necessary if the supply of gas during the coming winter is to be maintained without serious risk of interruption, and that in these circumstances he views with apprehension any change in the existing methods of manufacturing gas which would tend to increase the consumption of coal by gas undertakings.

Having regard to these considerations, the Board of Trade have come to the conclusion that they must renew the request contained in their announcement of December last, and they suggest that the relaxation of statutory requirements to the extent therein indicated should be continued for a further period.

I am to add that the concurrence of local authorities in this arrangement is sought solely on account of the coal situation; and I am to state that the position will be very carefully reviewed by the Board of Trade before the end of October next.

I am, &c.,

(Signed) E. J. Chapman.

BRITISH SCIENTIFIC PRODUCTS EXHIBITION.

Another Interesting Display.

There will be general remembrance of the exhibition arranged last August, under the auspices of the British Science Guild, at King's College, and afterwards in Manchester, for the purpose of showing how, under the stress of war, we had made ourselves independent of products previously obtained largely from enemy countries. There was opened last Thursday, in the Central Hall, Westminster, a second exhibition, also organized by the Guild, with the object of promoting the development of the industries thus established, and of encouraging the foundation of new British manufactories depending upon progressive science and invention. Many inventions have been devised, and a great volume of scientific research has been carried out during the past five years in the works and university laboratories of Great Britain. Much of this work has hitherto necessarily been withheld; but some of it can now be displayed.

The exhibition was opened by Lord Crewe; Lord Sydenham (the President of the Executive Committee) presiding over a large gathering, among whom were Lord Moulton, Sir Philip Magnus, Sir Robert Hadfield, and Sir Richard Gregory (the Chairman of the Exhibition Organizing Committee). One of the speakers was Lord Moulton, who referred to one thing which he said made him a little ashamed of his country. It was obvious that the Germans were taking pains over particular products so as to produce them of a better and more uniform quality, and therefore making them more valuable to the English consumer. What was more evident than anything else was that the specialized attention which worked at a little thing in order to improve it was being guided by all the scientific knowledge that was at the command of the world. English manufacturers were too frequently content with a quality which they could sell in very large quantities, and for which they had a safe market, and were not realizing that this advance in quality would gradually bring with it a greater demand, and would make the wholesale trade pass into the hands of their competitors. During the war, he was put to develop the whole power of the nation in a thing which, he hoped, would be perfectly useless in a very short time—namely, high explosives. There, again, he had to test the power of the nation to concentrate its whole force on production on an enormous scale. The four years he had spent on this, made him feel that our nation had nothing to fear from any nation. All it had to fear was from its own self.

The formal opening was preceded by a meeting in the hall of members of the Technical Circle of Journalists—presided over by Mr. Leon Gaster—at which an address was delivered by Sir Richard Gregory on the aims and objects of the exhibition, which was then open for special inspection by the scientific, trade, and technical press. In the course of his address, Sir Richard urged that the exhibition affords an opportunity for vindicating the supremacy of Great Britain in the field of discovery and invention. It shows the strength and variety of home manufactures; and from it the public may learn that science is indispensable to industry in peace as in war. During the war, science was successfully called into service in many directions. It is not generally understood in this country how the work at universities and other institutions for higher training is bound up with national welfare; but the articles in the exhibition catalogue on research as carried on in them during the war should serve to enlighten the public as to their debt to scientific workers. The laboratories of these institutions provided the idea for machines and munitions which assisted our forces in the field to achieve success; and without the men and knowledge they contributed, we could not have overcome an enemy who for years viewed all applied science in the light of its use in possible warfare. When necessity demanded, our men of science showed that in every direction they could devise means of offence and defence superior to those of the foe against whom our armies had to contend. The way in which, during the war, the universities faced problems of an entirely novel character, and concentrated attention upon them until solutions were reached, is an earnest of what they can accomplished for industry in times of peace; and it is to be hoped that this factor of progress will continue to play an important part in national life. Great industrial developments depend upon new knowledge obtained by scientific investigation, and the exploitation of that knowledge in invention and industry. It is the business of the scientific investigator to discover new facts or principles, and of the engineer or the inventor to recognize and apply the results achieved. Labour cannot create new industries without new knowledge; and this is obtained by scientific research, whether secured in the laboratories of universities or of works. Many of our greatest modern industries have had their origin in scientific work which apparently had no relation to practical needs when it was first undertaken. Numerous examples are to be found in the exhibition of applications of science to industry.

The allusion just made to the catalogue may be amplified by the remark that the value of the exhibition to the visitor is greatly enhanced by the excellent descriptive book—modestly termed a catalogue—which has been edited by Sir Richard Gregory himself. This catalogue is issued chiefly to instruct the public, and to interest as many people as possible in the applications of science to industry—in the work done at the universities, &c., which could be used by the engineering mind for the development of industry. Although the actual cost is considerably more, the catalogue is being sold at 2s. 6d. net, in order that it may serve its purpose with the public. The Committee believe they are doing well from the point of view of the exhibition to let the country know what is being done on the purely scientific side, as well as what has been done by progressive manufacturers themselves represented in the exhibition. In this connection, it may be explained that the funds for the exhibition are entirely voluntary. No charge is made to exhibitors for space, or for the insertion of their names in the catalogue. These things are offered to exhibitors in the hope that they and others interested nationally in our industries will come forward and meet whatever cost is involved in the enterprise. Not a single member of the Committee receives a fee of any kind for the very arduous work connected with the exhibition.

The Exhibits.

The catalogue already referred to is divided into five parts—"War Work at the Universities and Other Institutions," "Works Research Laboratories," "Industrial Research Associations," "Selected Scientific and Technical Books," and "Descriptions of Exhibits." Turning to the last named, it is seen that the exhibition is divided into eleven sections, some of the most important of which, from the "Journal" point of view, will be found grouped in the basement of the building, where there is more room available than is the case on the ground floor. The names of some of the exhibitors are included in the subjoined notes.

In the Physics Section, the Optical Pyrometer Syndicate show the "Wedge" optical pyrometer—a portable instrument enabling intelligent employees to measure and control temperatures above 500° C. in nearly all industrial operations. It has already been adopted in the manufacture of gas. There are the Parkinson Stove Company's geysers and fires, and the Tilley High-Pressure Gas Syndicate's lamps and soldering stoves.

Passing over the electrical and medical appliances, paper, and agriculture, we come to the large section of chemistry—embracing plant, laboratory ware and apparatus, heavy chemicals, fine chemicals, explosives, and dyes. Attention is drawn by the Accrington Brick and Tile Company, Ltd., to the Guttman patent cellular filling material for absorption towers—formerly made in Germany, but now produced by this Company. One of the two types exhibited has a scrubbing surface of 34 sq.ft. per c.ft.; and the other, 22·5 sq.ft. per c.ft. The British Chemical Ware Manufacturers' Association, the British Laboratory Ware Association, Mr. H. J. Elliott, Howard Rawson and Co., Hyposol Ltd., and the Scientific Supplies Company are interested in scientific glassware and laboratory porcelain; while the Thermal Syndicate, Ltd., exhibit a large number of articles made from "Vitreosil"—which is produced by the fusion of pure silica in the electric furnace. The

British Glass Wool Company make glass wool free from lead and borax, for the filtration of acids, alkaline solutions, &c.

Coal-tar derivatives are to be seen on the stands of the Gas Light and Coke Company, John W. Leitch & Co., the Research Department of Woolwich Arsenal, and the South Metropolitan Gas Company (who divide the products in the various sections into two groups—(*a*) those which were being manufactured before the war and are still being manufactured, and (*b*) products manufactured since the declaration of war. The display of dyes and intermediates is a fine one; and among the exhibitors are the Bow Bridge Dyes and Chemical Works, the British Alizarine Company, British Dye Stuffs Corporation, the Gas Light and Coke Company, and the South Metropolitan Gas Company. There are some beautiful potash compounds manufactured by the British Cyanides Company from blast-furnace dust obtained under patents owned by the British Potash Company. Several samples of neutral sulphate of ammonia are to be seen. One is displayed by the Gas Light and Coke Company; and another by the Hydronyl Syndicate, Ltd., who have an hour-glass showing how neutral sulphate obtained by the Linder-Lessing process runs through small orifices, and can be passed through a farmer's drill or spread evenly by hand on the soil as a top dressing. In the centre of the South Metropolitan Company's stand (which, by the way, is in the form of a gasholder with side-plates removed) is an air-jet fountain, to demonstrate the special characteristics of "Metro" dry neutral sulphate of ammonia. Seeing the material as it is thrown up and falls in the fountain, one understands the ease with which it may be distributed on the ground, owing to its dry, finely-divided nature. Another exhibit on this stand is "Metroxide" for the purification of gas—Grade I. for gas-works with normal purifying area, and Grade II. for works with low purifying area.

Under "Fuels—Solid, Liquid, and Gaseous," the Gas Light and Coke Company have a fitted-up kitchen, in which their advisory staff give demonstrations of the scientific and economical use of gas fuel. Samples are exhibited from the private collection of Mr. J. Arthur Greene of oil, &c., obtained from carbonaceous materials; and Messrs. Sanders, Rehders, and Co. display their well-known "Sarco" specialities—including the recording gas-calorimeter and bomb fuel calorimeter.

In the section devoted to "Metallurgy," gas-coke and gas furnaces form the subject of an exhibit by August's Muffle Furnaces, Ltd.; while gas-furnaces for various industrial purposes, of types with which "JOURNAL" readers are familiar are shown by the Davis Furnace Company, Fletcher, Russell, & Co., the Monometer Manufacturing Company, the Richmond Gas Stove and Meter Company, and John Wright & Co. Photographs, &c., are displayed by Mr. A. Hermansen, of the Hermansen patent recuperative producer-gas fired furnaces; and by the Koppers Coke-Oven and Bye-Product Company, of big installations of the types of plant with which the name of Koppers has so long been associated. Fire-clay goods of all kinds are on the stand of the Leeds Fire-Clay Company, as well as "Frittite" cement, for mending tiles, rendering retort-settings gas or air tight, &c.

It should be added that the exhibition will remain open until Aug. 5. There are displays of films of technical interest, and lectures on special aspects of the applications of science to industry. Next Friday Prof. H. E. Armstrong will lecture on "Coal Conservation;" and on the 28th inst., Mr. L. Gaster will take for his subject "Scientific Lighting and Industrial Efficiency."

Prof. Bone on the Coal Commission Reports.

The issue dated the 7th inst. of the "Bulletin of the Federation of British Industries" contains a lengthy article by Prof. W. A. Bone on the "Coal Commission's Reports," which he opens by explaining that, while as an economist he is strongly opposed to the ownership of mines, he sees no serious objection to the nation acquiring the coal. The proper functions of the State he regards as: (1) To own the coal. (2) To prescribe on what terms and conditions, having regard to the interests of the community as a whole, it shall be worked by mining companies so as to ensure that eventually all the available coalseams exceeding a certain minimum thickness shall be properly worked. (3) To prevent the creation of monopolies, and to maintain a free market in coal. (4) To safeguard the health and safety of the miners. Everything else should be left to private enterprise. Among the points considered is the falling off in this country of the output per worker, which Prof. Bone says is "a significant and highly unsatisfactory feature about the present system, which was not sufficiently probed by the Commission, but upon which the public ought to be further enlightened." Figures are quoted which fully justify this opinion.

Ministry of Health Act, 1919.—An Order in Council was made fixing the 1st inst. as the day for the Ministry of Health Act to come into operation. On that day all the powers and duties of the Local Government Board passed to the Ministry of Health; the question of the transfer to other Government Departments of any existing powers or duties not relating to matters affecting or incidental to the health of the people being reserved for consideration and decision at an early date. All communications on subjects previously within the jurisdiction of the Local Government Board should accordingly now be addressed to the Secretary, Ministry of Health, Whitehall, S.W. 1.

ELECTRICITY SUPPLY MEMORANDA.

THE Incorporated Municipal Electrical Association has been holding its first *post*-war annual conference at Felixstowe; and though the organization has not yet shaken off all war-imposed trammels, there was on the occasion discussion of paramount importance to the industry. Electrical administrators and engineers cannot at the moment decide with any definiteness where the industry stands. Strange things for them are in the making in the hands of the Legislature. The plans are altogether unique; and there is nothing upon which to shape an opinion as to the likely outcome of the new position in realizing on balance a higher economy and efficiency, which will lower the cost of current to the consumers. But so far as the conditions permit of the exercise of thought and the formation of ideas, there is a marked difference of opinion as to whether the Government scheme is going to promote the interests of the industry in any better manner than the industry could have accomplished without any more aid from the Government than its consent. When we see the long lists of objections, varied in substance and degree, and of desired amendments to the Electricity Supply Bill, we think it safe to say that fear preponderates over satisfaction as to the scheme as it stands resulting in any genuine good. The Association has framed an indictment of the measure, and suggested modifications. But the President of the Associaiion (Mr. Frank Ayton, of Ipswich) appears to be optimistically inclined. He says, and truly, that the ultimate success of the measure will largely depend upon the choice of the Electricity Commissioners and the constitution of the District Boards; and, we would add, the subsequent "choice" and the "constitution." He points the obvious when he says that the Commissioners should be chosen solely upon their technical and business qualifications, and their suitability for the position. However, in his opinion, the electricity supply industry will at last "have secured its Magna Charta, and have been freed from those legislative shackles which have for so many years impeded its free development in this country." We would suggest that what is now proposed should be examined well to ascertain whether new shackles are being forged which will be heavier than those that may be displaced by the new order of things. The gas industry is also looking for freer motion; but in the relief from one form of shackles, it does not want to come under some other form that may turn out infinitely worse.

The "Magna Charta."

Mr. Ayton believes that the prosperity of the electricity supply industry is indissolubly linked-up with that of the nation's industries. So is that of the gas industry, only over a wider range of industrial operation. But the gas industry has not claimed any preferential consideration in consequence. As a general statement, he disagrees with the correctness of the declaration that the actual cost of electrical power to the industrial consumer represents only a small percentage of the whole cost of production in the factory. Very well. This being so, Mr. Ayton may rest assured that the manufacturer will exercise his right of choice wherever other power agents can show greater economy than electricity. He perhaps has not overlooked the matters raised by Sir Dugald Clerk in his Society of Arts paper, nor the references made in last week's "Memoranda" to modern steam-engine efficiencies, as well as the efficiencies of the new "Still" engine. Even in power electricity is not going to ride forward unchallenged. In the "Electrical Times," it is noticed that Mr. F. Leigh Martineau states that a "Still" gas-engine has been constructed which has run successfully for a long period, the total weight of which with all its auxiliaries, was only 14 lbs. per B.H.P. It gave 500 B.H.P. And a "Still" heavy oil-engine has been in use for a long time which weighs 31 lbs. per B.H.P. There is no reason why engines on this system cannot be built to give 20,000 B.H.P.; and such a one has already been designed occupying a floor-space only 60 ft. by 25 ft., and capable of giving an overall efficiency from coal at full load of about 40 p.ct. It is suggested by electricians that engines such as these cannot affect the Government electricity scheme, in which 1·5 lbs. of coal is estimated per B.H.P.; but the "Still" type of engine would require only 0·5 lb. for the same duty. Mr. Martineau also mentions that the "Still" engine needs about one-fifth of the quantity of water that is necessary for condensation purposes with turbines. One other fact is of primary importance to the success of the Government scheme; and it is that sufficient current can be sold to create a good load factor. If, remarks Mr. Martineau, the "Still" engine in comparatively small units can produce energy at a less cost and save fuel into the bargain, how will the selling of current be successfully carried out under the Government scheme, and who will pay the necessary charges on the capital outlay? "Economy must be the watchword for some time to come; and it will be wise to think deeply before being led into useless squandering of public capital." The times are getting more and more interesting. Some of the bottled-up advances that have been quietly made during the period of the war are being let loose; and they are not all to the advantage of electricity.

Industry and Economy.

Transmission. The importance of the question of transmission in relation to the provision of centralized electricity generation is still openly recognized by but comparatively few electrical engineers. The Committees who have reported to the Government have maintained a discreet silence regarding it, probably because they did not know much about it. The Government are manifestly not aware of the significant factor that it is in the problem; and there has been no definite inquiry in relation to it. The Government do not even know whether it is cheaper to convey coal, gas, or electricity. Why should they know or trouble? The policy of the Government is to proceed in the dark, and to trust to good fortune to come out right the other end. It is not a wise proceeding; but still it is the policy of the British Government. They have not yet seen that there is any connection between the shorter working hours in industry and the load factor upon the generating stations that they are hoping to put up through the wonderful machinery of the Ministry of Ways and Communications, the Electricity Commissioners, and the various District Boards about the country. The question of transmission was brought before the Incorporated Municipal Electrical Association by Mr. S. L. Pearce, of Manchester, who has made a considerable study of the matter; and he introduced to the members comparative costs of electrical transmission by aerial and underground cables, but not of the cost in relation to that of carrying coal or gas. The costs showed something in favour of overhead transmission. But there are collateral disadvantages. Underground cables can be worked at greater pressures; safety and reliability are of higher order; and, if wayleaves are obtained, the expense of running cables through agricultural soil should not be great. There should be no need to break-up the hard macadamized or other formed surfaces of main roads, unless there is a desire to augment expense.

Some Considerations. The general tendency of opinion was in favour of underground conveyance, partly for the reasons of safety and reliability, and the probability of higher pressures being allowed. Mr. Pearce pointed to the fact that strategic and climatic conditions favoured underground conveyance. The vulnerability of aerial wires to malicious damage and injury from aircraft accident, and the danger they would be to airmen, are factors which require very serious consideration. In comparatively undeveloped areas, overhead lines might be used as branch feeders and distributors. Moreover, to obtain the same degree of reliability with the generating station at the centre of gravity of the load, it would be necessary for the lines to be at least completely duplicated, and preferably run by separate routes. Mr. B. Welbourn sided with Mr. Pearce, so did Mr. W. M. Selvey, and so too did Mr. S. E. Fedden, of Sheffield—in fact, Mr. Fedden has come to the conclusion that it is not a commercial proposition to go much further for a site for a station than 10 to 15 miles from the centre of maximum demand; and that it would be better to bring coal to the centre near where the big block of power is required than go to an ideal site, and have to transmit electricity, with all the losses, thirty or forty miles. In his opinion, even if coal were saved at an ideal station at a distance, it would be at the expense of consumers. Again we find Mr. C. J. Beaver supporting the underground system of transmission; and so did Mr. R. A. Chattock, of Birmingham, who pointed out that, even if overhead transmission was adopted, it would be necessary to go underground when a densely populated area was reached. He mentioned another matter of importance. In the Birmingham area—this would apply to many of the industrial districts—there is a considerable amount of acid in the air, which soon corrodes all metal work; and therefore the electrical leakage would be progressively much greater. Mr. C. H. Wordingham is not persuaded that there is no saving in overhead transmission; and he urged that there should be no jumping at conclusions. As to the strategic aspect, Calais, which was bombed during the war, had a considerable amount of high-pressure overhead work in it; but no damage was done to the high-pressure lines by bombing. They were lucky; but it would be a fatal mistake to judge of reliability in war by this particular experience. In war, nothing should be left to chance. Does Mr. Wordingham really suppose that lines supplying the factories in extensive munition-producing areas will in future be exempt from the attentions of an enemy. There are those among us who have got something to learn from the conduct of the war which has just been brought to a happy close. There was not much said during the discussion as to the actual cost of transmission, which is dependent rather upon maximum load than upon load factor. But Mr. Selvey stated that a railway man had told him that each ton of coal conveyed by his railway was carried about ten miles for a consumption of 1 lb. of coal. Can electrical energy be sent along a cable at any similar cost or rate of loss? The same speaker laid it down as an acceptable fact that every ten miles run above the first twenty miles of transmission adds at least 10 p.ct. to the actual net cost at which one can sell energy. The question of the cheapest form of transmission of energy over long distances is not yet solved in the minds of electrical engineers; and, anyway, they are not unanimous as to whether, all things being fairly and impartially considered, it will be the better plan to transmit above or under ground.

Speculation. The Government are following very much their own inclinations as to procedure in the matter of the Electricity Supply Bill. Whether the scheme be good or bad, or whether or not investigations should be prosecuted in other directions so as to ascertain whether the premises from which deductions have been drawn are sound, do not weigh with them in the slightest. The Government have made up their minds; and, Parliament or no Parliament, there is an end of the matter. The scheme has to go through. The Electricity Bill has not yet passed the House. Nevertheless, in a small House, with only something like 160 members voting (the majority of whom apparently did not understand the position more than that their support was expected by their leaders), the Government obtained agreement to money powers in respect of the advance of 20 millions in order to carry out the initial work associated with the scheme, and of the guarantee of the interest on 25 millions more stock. There were amendments moved; and some sharp criticism, which showed that the speakers were fully convinced the Government were being led blindfold in this matter. From here and there the word "nationalization" was heard. Mr. G. Balfour, for instance, described the electricity plans as part of the general scheme of nationalization which is upsetting the whole country. The Government could supply no exact information as to how the money was to be expended; they could not say whether the scheme would be financially successful; all that could be said on their behalf was that they had every reason to believe, on the best advice they could get, that the scheme would be financially reproductive. That is all; and that is the strength of the case on which the Government are proceeding. The Government should publicly say who were the experts who gave them this advice, because some of the most eminent men in the electricity industry have not the same confidence. According to the White Paper that was issued recently regarding these financial proposals, any money advanced from public funds is to be refunded and interest paid on it. The declared satisfaction of the Government as to the scheme paying is not reflected by what Sir A. Williamson, who was Chairman of the Board of Trade Power Committee, told the House—this in support of the Government proposals. He said that "there would undoubtedly be a loss in taking over obsolete plant, and probably also in the new stations that would be created, because they must anticipate a demand which did not exist, and they could not possibly expect that a station would pay for a number of years until the demand had grown." So the Government are anticipating losses for some years, while they are confident on the best advice that the scheme will be financially reproductive! They also find it advisable to have power to guarantee the interest on 25 millions, as well as power to advance to the industry 20 millions of public funds. There should be no difficulty in securing money without the aid of public funds for concerns the reproductivity of which is of a golden order. The Government spokesmen have supplied the best of possible evidence that they are proposing to indulge in a piece of electrical speculation of a large order. The price of current to electricity consumers threatens to go still higher.

Plant Sufficient and to Spare. There is no doubt that there is a great deal of excess generating plant in the country as the result of the disappearance of the demand for power for munitions supply. One result of this decline is that the price of electricity has had to be raised in many industrial areas. An electric power company with its ramifications and diversity of demand is a good test; and at the recent meeting of the Power Company serving Shropshire, Worcestershire, and Staffordshire, it was stated that the demand on the stations fell off considerably on the conclusion of the armistice. Fresh orders have been coming in; but, for the first half of this year, there has been a reduction of output as compared with the same period of last year. To this the information was added that the plant capacity is not yet so fully occupied as it is believed it will be when the area returns to ordinary peace conditions. This indicates that, with a little strengthening here and there, and an amount of interlinking of stations, there is generating plant in the country sufficient for some time to come without going in for any unnecessary expenditure on materials and labour at present cost levels.

Books Received.—From Messrs. E. & F. N. Spon, Ltd., No. 57, Haymarket, S.W., we have received a copy of a practical treatise upon "Hot Water Supply," by Mr. Frederick Dye, who has already made himself known both as an author and a lecturer. The price of the book, which goes fully into the question of the fitting of hot-water apparatus for domestic and general purposes, is 8s. 6d. net. An early opportunity will be taken of reviewing its contents. Messrs. Spon also forward a copy of "Automobile and Aero Engines," by René Devillers, price 16s. net. This is a translation from the French of the work of an author who is claimed to possess very special qualifications for writing such a handbook for students, draughtsmen, and designers. The translator is Captain W. J. Walker, B.Sc., Assoc.M.Inst.C.E., Lecturer on Internal Combustion Engineering at the Manchester College of Technology. Both books are well printed and plentifully illustrated.

SOUTHERN ENGINEERS AT THE OLD KENT ROAD WORKS OF THE SOUTH METROPOLITAN GAS COMPANY.

Developments from and upon the Work of the Liveseys—Father and Sons.

THE Union Jack fluttered from the top girder of the big holder in the Old Kent Road Gas-Works, and from the offices and other convenient points, last Thursday morning, in celebration of the Great Peace; but they also seemed to bid cordial welcome from the distance to the large number of members of the Southern District Association of Gas Engineers and Managers who journeyed from near and distant parts at the invitation of the Chairman (Dr. Charles Carpenter) and his colleagues on the Board of the Company. This event was the outcome of a graceful thought and action on the part of Dr. Carpenter. The first prominent office that Mr. Frank Livesey, the Engineer and Manager of the Maidstone Gas Company, has held in the organizations of the gas profession is the presidency of the Southern District Association; and therefore the occasion was one when a special invitation could be issued to the members to visit the works with which the names and activities of grandfather (Mr. Thomas Livesey), uncle (Sir George Livesey), and father (Mr. Frank Livesey) are indissolubly associated. As the visitors walked down the road leading to the offices, they saw the lifelike statue of Sir George; and just beyond was Dr. Carpenter shaking hands and personally welcoming the visitors, to whom he gave up the whole day, with all the members of the staff who could be of service in contributing valuable information. And the Old Kent Road works are packed with interest, which would take a whole volume to describe in detail.

If there is one maxim which the Company follow with strict and earnest observance, it is that, if a thing is worth doing at all, it is worth doing well. The principle is applied not only to business, but to other things. It was applied to this visit as it has been applied to other visits. Everything had been well organized for the day. Directional cards showed one where one should go; and what one should do. And everywhere one went according to pre-arranged programme, there were cards describing the apparatus, or what was going on. The works, too, are extensive, and yet not the most extensive of the Company's stations. But they are the headquarters, where much work of importance not only to the Company but to the industry and country is pursued with a regularity day by day with a view not only to protect the Company and its consumers, and to keep every part of the work and output of every commodity up to standard, but to extract from the unknown fresh knowledge which has for its object development—development of economy, of efficiency, of greater utility. In achievement lies added strength. The programme was arranged so that the morning was spent in the extensive and richly equipped chemical and physical laboratories and the burner-test departments; and then, after lunch, the visitors were taken to see the operations in the retort-houses which give the results in calorific quality and composition of gas which the Company seek to maintain.

Before starting off on an exploration which was to be so extraordinary instructive, the members assembled under the glass roof by the side of the offices, and were there separated into groups each visitor being given a button with the number of his group upon it, so that no one could mistake the group to which any individual belonged. It was a good idea, and saved much trouble. While there, we came across Mr. F. M'Leod, the Secretary, Mr. G. M. Gill, the Chief Engineer, Mr. E. V. Evans, the Chief Chemist, and Mr. A. Stokes, Chief of the Sales Department. Our old friend (Mr. A. F. Browne) was actively engaged seeing that the plans were duly carried out; and his former work as Hon. Secretary of the Association had its efficiency again reflected on what he did on Thursday. For the visits to the Chemical, Physical, and Burner Departments, the groups were placed in charge of the following members of the staff: Group 1, Mr. E. Boiling; group 2, Mr. H. Pilbeam and Mr. C. J. D. Gair; group 3, Mr. J. S. G. Thomas; group 4, Mr. W. Hall; group 5, Mr. H. Putt; group 6, Mr. D. Chandler. In the afternoon visit to the retort-houses, charge was taken of the groups by Mr. T. Curr (1), Mr. A. H. Andrews (2), Mr. H. Corfield (3), Mr. G. Grosse (4), Mr. W. Payne (5), Mr. T. S. F. Gibson (6).

WORK PROCEEDING IN THE PHYSICAL AND CHEMICAL LABORATORIES.

Party by party, visits were paid to the Chemical, Physical, and Burner Departments. In the one over which he presides, Mr. Thomas first received the visitors. It is the department where physical work proceeds. But here we will only skim over what was seen, as a description of the large scope of the work appears in the re-publication elsewhere from a pamphlet distributed among the members. We saw the large photometer which is fitted with a secondary standard for the purpose of neutralizing the differences in colour between the pentane lamp and the lamp undergoing test. This is the photometer upon which Dr. Carpenter and Mr. James W. Helps read a paper some years ago at the International Photometrical Congress at Zurich. It has a tremendous range of usefulness. It can test any form of lamp and of any power. It can test a lamp at the horizontal or at any vertical height that the room permits, or at any angle. Samples of all the lamps, high and low pressure, on the Company's district are submitted to this test.

The galvanometer takes a large part in the research work that is proceeding in the physical laboratory. Attention was next directed to investigations into the heat-radiating power of different rare earths; the heat radiated being read on a horizontal glass indicator in degrees Centigrade. So far as the work has been carried out, there is satisfaction now that the heat-radiating power of gas-fire radiants has not yet been reached. At the time of the visit, a mantle was suspended over a bunsen gas-flame; and the disc of light thrown on to the glass indicator travelled along it to 340°. The mantle was removed, and only the flame was exposed. The disc fell back. Then another mantle was put on containing presumably a different rare earth. The disc shot along to 380°. Does not this indicate that there is no reason why there should not be an increase of the heat radiated by gas-fires by the incorporation of something—say rare earths—in the "fuel"? The South Metropolitan Company are searching for the answer; and time will show. Then investigation is proceeding as to the proper standard of gas; and in this conjunction there is research as to the consumption with gases of different compositions and supplied at different pressures. In certain lines of research the hot-wire anemometer is used. Explanation was given as to the apparatus devised for testing velocities of gas streams, and for determining that the amount of naphthalene solvent injected into a coal gas main may be proportioned to the gas flowing in the main. A slight modification of the anemometer enables determination as to whether gas is flowing in one direction or the other in a main. By the use of two bare or glass-coated wires placed across the gas stream, so that one of the wires is shielded from the cooling effect of the stream by the presence of the other wire, the wire on which the stream first impinges is cooled more than the other—the "out-of-balance" current in the bridge displacing the pointer in one direction, which may be marked "up." On reversing the direction of the flow of the gas-stream, the pointer is displaced in the "down" direction; the shielding effect now being reversed. On the suggestion of Dr. Carpenter, an investigation has been made to determine the ratio of the volume of gas to the volume of primary air induced in an "inverted" incandescent gas-burner, and the variation of this ratio during the period when steady conditions are being established in the burner.

In the chemical department were seen the careful methods of control of gas and secondary products manufacture, and how these are kept up to the Company's standards. Great care is taken to collect the samples, so as to be representative. Considerable attention is given to inerts, especially carbon dioxide and oxygen as well as to specific gravity. In the agricultural research department, we saw grass growing proceeding in four boxes, under equal conditions as to soil and everything else, save that in one of the boxes sulphate of ammonia was being used and in another sulphite of ammonia. Research, too, was proceeding into the production of dyes from the intermediates produced; and also into the complete removal of sulphur compounds from benzol for use as a motor fuel. A further investigation that attracted much attention is the extraction of nitrogen from coke by passing through it heated hydrogen. Whether anything will come of this is not, of course, known; but it is the object of the investigation to ascertain whether anything can be done in this direction.

BURNER TESTING AND NEW DOMESTIC APPLIANCES.

Then a visit was paid to the various burner-testing departments; and the minute care taken with the "Metro" burners of all descriptions was seen. There are standard gauges for all parts; and every part is subjected to gauging and scrutiny before the burners are assembled for sending out—the same with street as with domestic burners, the same with high as with low pressure burners. There are tests for character of flame and gas consumption. The street-burner nipples are all drilled with a single hole; and show a rather higher efficiency than the multiple-holed burner head for domestic service, which, on the other hand, is quieter. Attention was called to the "Metro" boiler-ring, which is claimed to give 60 to 70 p.ct. efficiency. Below the jet is a saucer shaped porcelain-white lined deflector, which deflects back heat on to the utensil supported above.

In another department was seen the externally heated "Metro" cooker. The main feature, of course, is that the oven is heated without gas burning inside. Another feature is that as the gas is lowered, so a damper is moved to reduce the flow from the vent. The grill is a neat contrivance. It is enclosed in a case at the back of the oven, and is lowered to the horizontal position when in use. It is thus altogether independent of the hot-plate, and, being raised and enclosed when not in use, is not subjected to deteriorating influences as is ordinarily the case.

In the industrial section, samples of the "Metro" furnaces were seen for high and low pressure work; and specially designed burners were shown in action for glass and other operations.

Luncheon and Speeches.

Even the hour-and-a-half that had been spent in the laboratories and burner test-rooms had only enabled one to get a very superficial idea of the extent and varied character of the control, research, and proving work that proceeds there. It is a wonderful organization. Days could be instructively spent in these rooms, in which there is so much scientific activity. But there was the programme; and there was a time-limit. Luncheon was fixed for one o'clock; and to the large hall of the Livesey Institute we were directed. The seats at the long tables were soon filled by the visitors and members of the staff—a place for everybody, and everybody in his place. Dr. Carpenter was in the chair, and to his right and left hand side were the President (Mr. Frank Livesey), Mr. Edward Hills and Mr. W. H. Bensted (Directors of the Maidstone Gas Company), the Secretary (Mr. F. A. Gulland), Mr. Samuel Glover, the ex-President of the Institution of Gas Engineers, and the Hon. Secretary of the Association (Mr. H. C. Head, of Winchester).

After luncheon, the loyal toast was heartily honoured; and then

Dr. Carpenter said: Mr. Livesey and gentlemen, on behalf of my colleagues on the Board of the South Metropolitan Gas Company and also its staff, I have much pleasure in welcoming you here to-day; and I would like to add how high is our appreciation of the compliment you have paid us by accepting the invitation. It seemed to us quite a natural thing, when Mr. Livesey for the first time occupies an official position in the gas world, that we should take the opportunity of asking him to visit the place which is so full of interest to him as it is to the whole gas industry. How much the gas industry owes to those who bore his name will be impossible, and is impossible, for me to say. The place is full of memories of his father, his uncle, and his grandfather. It was his grandfather who, somewhere before the year 1840, came to the Company when it was in great difficulties and great trouble. He left the Gas Light and Coke Company, where he occupied an official position; and I think I am right in saying that his brother was the Deputy-Governor of that Company. From the day he entered the service of the South Metropolitan Gas Company, the tide changed, and the beginning took place of that success which has, I think I may say, been continued until to-day. In looking over the records of that time, one cannot fail to be struck by one important matter—that was, how business knowledge and business methods were so largely applied to his dealings. He did not, as so many (if I may here say so) have done, seek to build in the works a memorial for himself. In constructing the plant that was necessary for his business, he appeared to have looked at everything from the pounds, shillings, and pence point of view. If an extension was required, his reason for recommending it was because it was going to improve the financial position of the Company, or to put it in a better position to carry on business—in fact he seemed to have used his administrative ability and engineering knowledge to carry out a very definite policy; and the policy laid down by him must have largely animated the sons who succeeded him. When he came from the Gas Light and Coke Company, he brought with him his eldest son George, who was then five years of age. I do not think our President's father was then born. It was on these very works that Sir George Livesey and his brother Frank learnt not only the principles of engineering but the principles of business, and applied them thoroughly and systematically to everything they undertook. For this reason, this is not in any sense of the word a show works. We have nothing to show. It is simply a business undertaking existing for carrying on business in South London. We have nothing of those great monuments which exist even to-day on many of the other London works. We have a retort-house in one case which might be Greek; I rather think it is Doric. [Laughter.] There is an example of a gasholder in which some of the most fanciful casting and ornamental work exists to this day. This sort of thing must have been taboo to the original Livesey; and certainly it was to his two sons. But whatever we have of interest to-day is not of that kind or character at all. I am not, however, going to take up your time enlarging upon that aspect of things; and I will confine myself therefore to asking you all to join with me in drinking "Success and Prosperity to the Southern District Association of Gas Engineers and Managers;" and with the toast I shall couple the name of Mr. Frank Livesey, our very good President.

Mr. Livesey (who was received with great applause) said: Dr. Carpenter, Mr. Gill, Mr. Browne, gentlemen of the South Metropolitan Gas Company, our hosts to-day, I voice the sentiments in the minds of all your guests when I say how heartily we thank you for your kind invitation, and how much we appreciate the opportunity you have given us of making a thorough inspection of these good old works. You, Sir, have kindly coupled my name, as President, with this toast. I feel there are very strong family ties which associate me with these particular works. My grandfather lived here, or close by; and I have always taken a great interest in the accounts of that old gentleman that have been so ably written and published in the "Co-partnership Journal." They have been to me a great source of interest. Under your able guidance, Sir, we have seen this morning how the twin sciences chemistry and physics have been harnessed to the wheels of industry, and the exact and precise methods here employed for obtaining the ideal conditions for the manufacture of gas and its residual products, and the care and attention paid to the manufacture of apparatus to be used for the consumption of gas in private houses and factories, demand and receive our instant admiration. It is a source of gratification to me to feel that for many years past I have recognized that there is only one burner that is really fit to use, and that is the burner I owe to you. I do not wish to pay you compliments; coming from me they would be of no avail. In throwing open these works to us to-day, you are doing good service to the gas industry in general, and especially to companies which have neither the means nor the staff at their disposal to carry on scientific research on the scale you do it here. Worthily too, Sir, you have carried on the traditions of co-partnership and all it entails—not by the mere values transferred to your co-partners, but by the encouragement of the spirit of thrift, of saving, and of investment will the spirit of co-partnership finally vindicate itself. I well remember the late Chairman when addressing the men here once made this remark. He said: "There are two classes of men in this world—those who save, and those who spend. Those who save build mills and factories; those who spend have to work in them." To me that statement is doubly true at the present time. In these two directions you have set the industry great examples, and have done splendid service, which we all appreciate. But, Sir, I feel that pure science and business methods will not alone extricate our industry from the morass of evil times on which it has temporarily fallen. There are three clouds now overshadowing our path; and they must be swept away. First, the reduction of our statutory dividend is such that the raising of capital for extensions is extremely difficult. Secondly, the control of housing seems likely to fall into the hands of men who as groups seem to grudge our industry the birthright of every Englishman, which is "a fair field, and no favour." And, thirdly, owing, I trust, to a misconception of the facts by our volatile Prime Minister, it appears likely that our rival industry will obtain from the Treasury twenty million pounds—no less—for the financing of their own industry, to the detriment of ours. In this respect, I hope that many present have already written to the members of the parliamentary constituencies to which they belong, and protested in the strong terms that I have done. [Mr. Livesey read a letter he had received from the Member of Parliament for Maidstone acknowledging his protest. It also mentioned that there was a very strong movement against nationalization, which the writer hoped would bear fruit; and he personally expressed distrust of placing trading schemes under parliamentary control by what is called nationalization.] I sincerely trust (continued Mr. Livesey) you will forgive my introducing these topics on this happy occasion; but I do so in order to ask of you, Sir, your support in any action we feel it our duty to take in connection with this matter—parliamentary action, lobbying, or publicity. And, Sir, we look upon you as one of ourselves. You have been through the mill, as pupil, assistant, station manager, chief engineer, and chairman; and you are particularly one of our own. We realize from the work we have seen this morning the kind of man you are. While we all appreciate that a man of such strong ideas as yourself cannot always be expected to see eye to eye with all of us, I do say most emphatically that when you act with us we are tremendously strengthened, and when you cannot see your way to go with us we are proportionately weakened. When you do go forward among your fellows in the gas industry, you will always, as in the past, receive a rousing welcome. In saying these few words, I trust, Sir, you will take them in the spirit in which I have spoken, for I do not imagine that any words of mine will cause you to deviate by one hair's breadth from the course which you have mapped out for yourself. I thank you most heartily for proposing this toast of the Southern District Association of Gas Engineers and Managers. I thank you on behalf of the members for your kind hospitality here to-day; and we hope we shall often have your genial presence at our meetings. I personally also thank you for your very kind welcome and hospitality.

Descriptions of, and reasons for, the work upon which the Company are engaged were then given by the Chief Engineer (Mr. G. M. Gill), the Chief Chemist (Mr. E. V. Evans), and the Sales Manager (Mr. A. Stokes).

Around the Carbonizing Plant.

Luncheon and speeches over, we recommenced investigation of the interest of the works in the same parties, but with different guides (already mentioned). The whole afternoon was spent in and about the carbonizing plant. In the pamphlet already mentioned, there is a succinct account of this part of the works, which may be introduced here.

The coal, much of which is carried by the Company's ships, is unloaded at the Rotherhithe works' coal-jetty, and is barged thence to Old Kent Road, *viâ* the Surrey Commercial Docks and the Surrey Canal. The coal is lifted from the barges to an elevated gantry by steam-cranes, fitted with Hone grabs; whence it is run into stores by means of trucks, weighed, and shot on to the breaker. It is then elevated to the high-level coal-hoppers supplying the retort-charging machines.

The modern retort-houses, Nos. 7, 8, 9, and 10 (the two latter now working), are each 150 ft. long by 71 ft. wide, and are built at right angles to the canal. Adjacent to each is a coal-store capable of holding 1750 tons. Each retort-house contains sixteen settings, ten retorts in a setting, or 160 per house. These retorts are 20 ft. long and of oval cross section, measuring 21 in. by 15 in. inside. Each retort deals with about 10¾ cwt. per charge; the carbonizing period being ten hours. The retorts are charged by West's compressed air machines; and the coke is discharged by Hunter-Barnett hydraulic "Copartner" pushers. The total output of gas per house averages 2,600,000 c.ft. per twenty-four hours.

The coke is carefully delivered by means of specially designed locomotive shoots to hoppers or baskets beneath the stages, where it is quenched. After draining, it is discharged into wagons and drawn out of the coke holes by endless wire ropes, driven by gas-engines, and finally tipped.

The pan breeze from the producers is washed and sorted into various grades of coke and clinker in an adjacent breeze-washing plant.

The producer gas is generated in outside producers—two to each house. In composition, it averages 29 p.ct. of carbon monoxide, 3 p.ct. of carbon dioxide, 8 p.ct. of hydrogen, 1·8 p.ct. of methane, and 58·2 p.ct. of nitrogen; giving a waste gas containing 19 p.ct. carbon dioxide, and 0·2 p.ct. oxygen. This on its way to the chimney shafts imparts some of its heat to the incoming producer gas, thus effecting a partial heat recovery. In the later design of settings, as may be seen in retort-houses Nos. 8 and 9, the producer gas is reheated by means of the waste gases, from 840° to 1400° Fahr., in passing to the combustion chambers.

The retort-houses are worked to produce a standard quality of gas of 14½ candle-power (No. 2 "Metropolitan" burner), of 560 B.Th.U. gross calorific value, and containing a maximum of 11 p.ct. of inerts. To effect this, retort-lids are adjusted, or changed and refaced when-

ever gas leaks are observed, while mouthpieces are faced-up when the retorts are re-set. During the draw, the faces of the lids and mouthpieces are cleaned from tar and pitch with a chipper. All retort-houses are frequently put under a pressure of 1 inch to 1½ inches in the foul main, in order that all bad doors and other leaky joints may be rapidly detected. Otherwise no special steps are taken to ensure that the percentage of inert gases is below the above-mentioned limit. These methods are employed at all stations of the Company, with the result that it has been found possible to work with considerable freedom in the amount of vacuum maintained in the foul main, and yet produce the desired quality of gas.

At the Old Kent Road a system of working with unsealed dip-pipes in the hydraulic mains was introduced in 1916, which has since been adopted in all four retort-houses at this works. With this method in use, the level of liquor in the hydraulic mains is maintained at ½-in. under the bottom of the dip-pipes; provision being made for sealing in the usual manner when the retort-house is shut-down on Sundays, or put on slow fire. No anti-dip apparatus is used: the pressure or vacuum maintained in the retorts being dependent only upon the retort-house governors. The object in view in introducing this method of working was to reduce oscillation and retort pressure to a minimum, and so obtain some improvement in the quality and quantity of gas produced. So far as can be judged, this object has been achieved, while no mishap has occurred, nor has there been any increase in the stopping of ascension-pipes, or of deposits in the hydraulic mains.

We do not think there is anything that can be usefully added to the foregoing account of what was witnessed in the retort-houses. On the bench in No. 10 house, there was a note affixed which bore witness to the retorts having seen 2237 working days. There was great interest in everything; and the guides freely gave of the information with which their experience had stocked them. There was particular interest in the outside producers; but if there was one subject more than another over which the members showed a fertile power of inquiry it was that of inerts. There is no question that the Company does keep them down to a low percentage, and by comparatively very simple means. But there has to be very precise attention to the retort-lids.

After leaving the retort-houses, a visit was paid to the workshops; and in one of them we saw retort-lids being machined and finished off, and finally connected to a faced mouthpiece, and tested under a 16-foot head of water.

TEA AND HOME.

It had now come to tea time; and in the tastefully decorated show-rooms, all sat down to the refreshing cup. It was very welcome. Subsequently adieus were said; and the visitors left duly impressed with the high character of the work which is proceeding as if all routine in character at these works, which hold so much of interest—historic and current—for professional gas men. The members were all highly gratified with the opportunity that Dr. Carpenter and his colleagues had voluntarily and so hospitably afforded them.

THE REGENERATIVE EFFECT AS INFLUENCING THE LIGHTING EFFICIENCY OF THE INVERTED INCANDESCENT BURNER.

By J. S. G. THOMAS, of the South Metropolitan Gas Company.

[Communicated to the "Journal of the Society of Chemical Industry."]

Two outstanding physical facts differentiate the upright incandescence burner from the inverted incandescence burner. (1) Owing to the fact that the motion of the mixture of air and gas just prior to the combustion in the case of the upright burner is upwards, and in that of the inverted burner is downwards, with the former more air can be naturally induced at the gas-injector per unit volume of gas than is the case with the inverted burner. The natural motion of the coal gas is upwards; and however the injector may be disposed with regard to the orifice at which the gas is burnt, this natural tendency will, in the case of the inverted burner, react upon the air-inducing power of the gas at the injector in the direction of diminishing this power, irrespective of whether the injector itself is directed upwards or downwards. (2) In the case of the inverted incandescence burner, the heated products of combustion stream back over those parts of the burner inside which the mixture of gas and primary air flows prior to its combustion. A certain amount of what is termed heat regeneration is to be anticipated from this circumstance; and the experiments described herein were performed to ascertain how far the efficiency of an incandescence burner is affected by the application of heat (applied regeneratively or otherwise) to the mixture of primary air and gas. Bearing in mind that the total radiation from within an enclosure at uniform temperature—the thermodynamic and realizable analogue of a perfectly black body—is proportional to the fourth power of the absolute temperature of the enclosure, it is anticipated that a slight rise in the temperature of combustion of the gaseous mixture would be accompanied by a great increase in efficiency in the light radiation from the burner, should the light radiation from the mantle follow any law approximating to that for the perfectly black body. Bunte [German Association of Gas and Water Engineers, 1907; "JOURNAL," Vol. XCIX., p. 27] states that it is well known that a slight rise in the temperature effects a relatively great increase in the light radiated; and it was by taking advantage of this fact that the inventors of high-pressure and intensified gas-burners secured an enhanced duty. The subject has been investigated experimentally in the following manner.

A "Metro" No. 3 inverted burner was supplied with coal gas and primary air, so that the proportion of primary air to coal gas corresponded with that necessary to secure a well-defined inner cone, such as is produced when the primary air supply is induced by the gas-injector. For this purpose, the usual air-holes of the burner were enclosed completely within a chamber, to which a supply of air under adjusted pressure was led through tubes entering the chamber at diametrically opposite points. The pressures of the gas and air supplies were suitably governed, and the volumes supplied to the burner were determined by meters inserted in the respective services. A determination of the candle power of the burner at successive angles of 10° below the horizontal was made—the burner not being enclosed within a globe. Arrangements were then made whereby the portion of the burner near the injector could be kept cool by means of cold water, which circulated through a compartment surrounding the injector. Maintaining the supplies of gas and primary air at their previous values, or as near thereto as possible, the radial distribution of luminosity was determined as before. Very little alteration of efficiency was produced by this treatment. Arrangements were therefore made whereby the mixture of gas and primary air could be cooled right up to the point at which the gaseous mixture was burnt. For this purpose a stream of water was maintained within the cylindrical jacket surrounding the injector, and likewise through a cylindrical jacket of annular section extending to the lowest part of the burner nozzle. The mixture of gas and primary air passing through this latter chamber prior to its combustion was efficiently cooled, as determined by subsequent experiment. The cooling of the gaseous mixture in this manner was accompanied by the efficient cooling of the products of combustion in their subsequent passage over the portion of the burner adjoining the nozzle. The trickling of such cooled and liquefied products of combustion over the nozzle would result in the breakage of the latter. This was prevented by employing the dished receptacle shown in fig. 1, which served to retain any liquid deposited in the cooled parts of the burner tube. In this manner, it was found that the radial distribution of luminosity could be readily determined with the incoming mixture maintained cool up to the point of combustion, or as near thereto as practicable. For purposes of comparison, a series of experiments was carried out with an upright incandescence burner, the primary air supply to which could be preheated to any desired temperature. Attempts to preheat the supply of coal gas were vitiated by the fact that, when exposed to an elevated temperature, certain hydrocarbon constituents of the coal gas are decomposed.

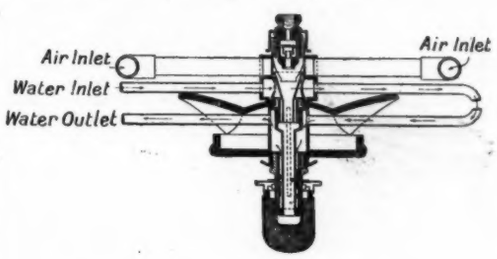


Fig. 1.

The procedure, therefore, was as follows: The air-holes whereby the upright incandescence burner ordinarily derives its supply of primary air were closed. The primary air was supplied under regulated pressure through an iron tube coiled within a small gas-furnace, whereby the coil could be raised to a white heat. Precautions were taken, by providing the furnace with an elongated flue, that the incandescence gas-burner did not derive any of the secondary air necessary for combustion from the products emitted by the furnace. The gas supply joined the air supply some little distance from the point at which the pipe conveying the latter emerged from the furnace. Uniformity of temperature of the gaseous mixture was ensured by the insertion of a large number of pieces of copper gauze within the pipe conveying the mixture to the burner—this portion of the supply pipe having a length of about 6 in., and being enclosed within asbestos. Just prior to entering the Venturi tube of the burner, the temperature of the gaseous mixture was ascertained by means of a thermocouple of Pt, Pt-Rh. The respective volumes of gas and primary air were separately metered, and maintained throughout as nearly constant as possible. A series of experiments was carried out in which the primary air was heated to various temperatures, and the candle power of the upright burner supplied with such air, ascertained in a horizontal direction.

The results obtained for the inverted and upright incandescence burner are tabulated herewith:

RESULTS.

"Metro" No. 3 inverted burner. No water cooling. Pressure of gas at gas-injector 25-10ths.

Gas consumption (corrected to 60° Fahr. and 30 in. pressure), 3·85 c.ft. per hour.

Primary air (corrected to 60° Fahr. and 30 in. pressure), 10·29 c.ft. per hour.

A. $$\text{Ratio}: \frac{\text{Primary Air}}{\text{Coal Gas}} = 2{\cdot}67.$$

Angle below horizontal.									
0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
Candle power.									
57·1	62·7	67·0	74·5	78·2	81·9	81·5	85·4	85·5	82·2

"Metro" No. 3 inverted burner as before, but with region of injector water-cooled.

Gas consumption (corrected to 60° Fahr. and 30 in. pressure), 3·84 c.ft. per hour.

Primary air (corrected to 60° Fahr. and 30 in. pressure), 10·21 c.ft. per hour.

B. $$\text{Ratio}: \frac{\text{Primary Air}}{\text{Coal Gas}} = 2{\cdot}66.$$

Angle below horizontal.									
0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
Candle power.									
58·4	63·6	68·4	75·6	76·7	81·2	80·7	76·9	79·5	72 3

"Metro" No. 3 inverted burner with region of injector and the nozzle maintained cool by a current of water flowing at the rate of 800 c.c. per minute.

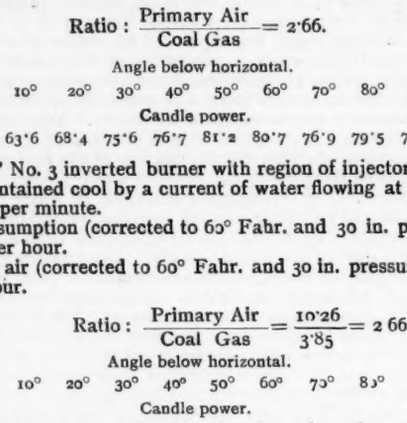
Gas consumption (corrected to 60° Fahr. and 30 in. pressure), 3·85 c.ft. per hour.

Primary air (corrected to 60° Fahr. and 30 in. pressure), 10·26 c.ft. per hour.

C. $$\text{Ratio}: \frac{\text{Primary Air}}{\text{Coal Gas}} = \frac{10{\cdot}26}{3{\cdot}85} = 2\,66.$$

Angle below horizontal.									
0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
Candle power.									
40·6	44·1	47·5	50·6	52·6	58·0	60·0	62·3	65·9	65·6

The results detailed are set out graphically on the chart (fig. 2)



A. No Water Cooling. B. Injector Water Cooled. C. Injector and Nozzle Water Cooled.

Fig. 2.—Radial Distribution of Candle Power.

and are also summarized in Table I. The results obtained with the upright burner, showing the effect produced by preheating the gas upon the lighting efficiency of the gas when used in conjunction with a mantle, are given in Table II.

TABLE I.—*No. 3 "Metro" Burner.**

—	(A) Without Water-Cooling.	(B) Region of Injector Water-Cooled.	(C) Nozzle and Region of Injector Water Cooled.
Gas consumption (c.ft. per hour) . .	3 85	3·84	3·85
Primary air (c.ft. per hour)	10·29	10 21	10·26
Ratio:			
Primary air : coal gas	2·67 : 1	2·66 : 1	2·65 : 1
Horizontal candle power	57·1	58·4	40·6
Candle power at 50° below horizontal .	81·9	81·2	58·0
Mean radial candle power	75·6	73·3	54·7
Candles per c.ft. at 50° below horizontal	21·3	21·1	15·1
Mean radial candles per c.ft. of gas. .	19·6	19·1	14·2

* This burner is not the most efficient of its class; but it was selected for the experiment in order to reduce the possibility of errors arising from the use of a smaller unit.

TABLE II.—*Results with Upright Incandescence Burner.*

Temp. of Gas and Primary Air Mixture Prior to Combustion.	Gas Consumption (Corrected to 30 in. and 60° Fahr.).	Primary Air (Corrected to 30 in. and 60° Fahr.).	Ratio, Primary Air to Gas.	Candle Power in Horizontal Direction.	Horizontal Candle Power per c.ft. of Gas.
°C.	C.Ft.	C.Ft.			
70	4·80	11·7	2·44	66·1	13·8
110	4·80	11·7	2·44	68·0	14 2
130	4·80	11·8	2·46	69·1	14·4
150	4·80	11·9	2·48	72·8	15·2
190	4·80	12·0	2·50	78 6	16·4
210	4·80	12·0	2·50	87·8	18·3
220	4·80	11·9	2·48	92·5	19 3
225	4·80	12·0	2·50	98·3	20 5
245	4 80	11·8	2 46	99·5	20 7
270	4·80	12·0	2·50	100·2	20·9

Conclusion.

The experiments clearly indicate that an increased lighting efficiency is obtained when the gaseous mixture of coal gas and primary air is preheated. Whether such preheating is achieved by a separate heating device, as in the case of the experiments with the upright burner, or by the flow of gaseous products of combustion over the incoming supply, as in the case of the inverted burner, the same result is obtained. No appreciable diminution of lighting efficiency is to be anticipated from cooling the region of the injector of the inverted burner employed in these experiments, as it has been shown that the temperature in such a region is normally only about 60° C. Considerable decrease of lighting efficiency is produced when the gaseous mixture is maintained cooled-down to the point of ignition. These results are in accord with those obtained by Bunte, who found that the efficiency of an inverted gas-burner of special construction was reduced from 24·5 mean radial candles per c.ft. of gas, to 15·5 mean radial candles per c.ft. by water-cooling the burner nozzle. Bunte points out that the outer mantle of flame in the case of the water-cooled burner had an area of 65 sq. cm. compared with an area of 45 sq. cm. in the case of the uncooled burner—an increase of flame surface being accompanied by a decrease of lighting efficiency. Prof. Smithells, in his article on "Flame" in Thorpe's "Dictionary of Applied Chemistry," attributes an efficiency of from 20 to 40 candles per c.ft. of gas (dependent upon pressure) to the upright incandescence burner, and an efficiency of from 20 to 70 candles per c.ft. of gas (likewise dependent upon pressure) to the inverted incandescence burner. It is noteworthy that an equal lower limit of 20 candles per c.ft. of gas is attributed to both upright and inverted burners. It would appear, therefore, that according to Smithells no increased duty is to be anticipated from the heat regenerative effect present in the case of the inverted burner.

This result is contrary to results obtained in the physical laboratory of the South Metropolitan Gas Company, in the case of an extremely large number of upright and inverted burners which have from time to time been submitted to test, with the invariable result that a well-designed inverted burner gives a duty per c.ft. of gas of the order of 50 p.ct. greater than is the case with upright burners. An increased efficiency of this order is seen to be obtained by preheating the gaseous mixture supplied to the upright burner to about 250° C., and a similar decrease by water-cooling the mixture in experiments with the inverted burner.

Smithells (*loc. cit.*) states: "The inversion of a bunsen flame modifies its form in such a way as to make it more efficient for heating a mantle. The outer film of flame becomes shorter, thicker, and more globular; and as the products of combustion necessarily drift back past the flame, there is a certain recuperation of heat." It is difficult, if not indeed impossible, to reconcile this statement of greater efficiency for mantle heating in the case of the inverted flame, and the further statement of heat recuperation, with the subsequent statement of the respective performances of upright and inverted burners. In the light of the present experiments, the effect of heat recuperation upon lighting efficiency is clearly evidenced, and it is surmised that the anticipated effect can be absent from any type of inverted burner only when, owing to the faulty design of the burner, no appreciable degree of preheating of the mixture of gas and primary air occurs.

This investigation and its publication were suggested by Dr. Charles Carpenter, to whom the author desires to express thanks for the ready provision of the necessary facilities and his inspiring interest in the work.

Lubrication of Internal Combustion Engines.—Reference to his experiments on lubrication was made by Mr. W. J. Still, when replying to the discussion on the Society of Arts paper describing his invention which was noticed in a recent issue of the "Journal." Mr. Still said he had carried out a long series of experiments on lubrication before building any engine. He had made some trials with a shaft heated to a temperature such as he expected to run at, and also in contact with flame, and had found that if the temperature rose to about 450° Fahr. difficulties began; but below this point perfectly good lubrication was obtained under very heavy loads in the cylinder with a mixture of heavy cylinder oil and graphite.

THE CHEMICAL AND PHYSICAL ACTIVITIES OF THE SOUTH METROPOLITAN GAS COMPANY.

CONTROL AND RESEARCH.

In our account of the visit of the members of the Southern District Association of Gas Engineers and Managers to the Old Kent Road works of the South Metropolitan Gas Company, mention is made of a pamphlet which was distributed among the visitors. The portion describing the extensive character of the chemical and physical research and control work which proceed at the station is so interesting that we reproduce it *in extenso*.

CHEMICAL AND PHYSICAL DEPARTMENT AND BURNER-SHOP.

The purpose of the Chemical and Physical Department of the Company, however imperfectly it may have attained its ideal, is the application of science to the gas industry. While on the one hand investigations or control are proceeding on questions appertaining to the carbonization of coal, the purification of gas, and the working-up of bye-products, on the other hand matters relating to the utilization of gas, the design of appliances, &c., are receiving attention. The basic principle of the Company's policy is the manufacture and supply of a straight gas of constant chemical and physical characteristics, and to supply at a constant pressure. Such gas is consumed in appliances with fixed gas and air supplies. No adjustment other than by a tap is possible—indeed, it is not required. In order that the Company's appliances, whether used for the production of light, heat, or power, may be standard apparatus, their design and standardization are part of the Company's responsibility undertaken to the consumer of gas. Although the reorganization of a large district of supply, and the displacement of inefficient apparatus, is a tedious process, it is a matter of satisfaction that the Company's district is at the moment equipped very largely with these "Metro" appliances.

In the attempt to achieve the high ideal set by the Company in the matter of the production and utilization of gas, various control and research departments have been organized. These include: (1) A chemical laboratory, with separate sections directed to control and research operations; and (2) a physical laboratory, embracing control and research sections, together with a burner-shop, for the manufacture and assemblage in bulk of appliances for use on the Company's district—the appliances embodying the latest result of research work. These several sections will now be considered in detail, commencing in the natural order with

THE WORKS SECTION OF THE CHEMICAL DEPARTMENT.

A control laboratory is established at each station, the whole being centrally directed. This section is responsible for the chemical efficiency of the gas-making and purification processes. Its efforts are directed to the constant production of gas of standard quality.

From the point of view of this department, gas making is regarded as a chemical process; and systematic sampling and analysis are practised throughout the operations involved. Wherever fuel is consumed, its combustion (whether direct or indirect) is chemically controlled. In the case of two-phase combustion, each phase receives separate attention; so that a high overall efficiency may be attained, and the heat developed at the points desired. In conjunction with the retort-houses at the Old Kent Road are shift-testers, who, together with the foreman, maintain a high-quality producer gas of the specified composition, or as near thereto as possible. The temperature of the combustion chamber is maintained at from 1300° to 1340° C.; and complete combustion of the producer gas must be achieved without the use of an excess of secondary air—the composition of the waste gas being approximately as already stated. Temperature and pressure records of the coal gas and producer waste gas systems are made. The coal gas is analyzed, its specific gravity, and illuminating and calorific values are continuously determined, and the information derived from these chemical and physical determinations is utilized in the control of the retort-houses.

The efficiency of combustion in the boiler-houses is similarly controlled by systematic analyses of the waste gases; and freedom of the flues, &c., from blockage is ascertained by pressure observations.

The whole of the water used in the boilers on the works and in the steam-lorries of the Company is softened in a continuous lime-soda plant; and periodical tests are made to ensure that the hardness is reduced to from 3° to 4°. This, on the average, represents a chemical efficiency of the softening process of about 80 p.ct.

The condensation process is controlled by systematic observations of the water and gas temperatures, and gas and tar pressures. Tar is circulated in the Carpenter condensers for the partial removal of naphthalene. The ammoniacal liquor is worked up to 8-oz. strength; and the whole of the ammonia, except about $\frac{1}{2}$ grain per 100 c. ft., is removed from the gas. Efficiency is maintained by utilizing results obtained by analyses of gas and liquids and from temperature and pressure records.

The control exercised in the purifying sheds enables inefficient batches of purifying material to be quickly detected and dealt with. Ample warning is obtained of a charge becoming fouled. The sulphur content of the spent oxide is, in general, from 45 to 50 p.ct. on the wet basis. Sulphur compounds in the gas other than sulphuretted hydrogen are converted into hydrogen sulphide in the catalytic plant, and subsequently removed by oxide of iron. The efficiency of this conversion operation is controlled by means of sulphur tests and temperature records of the working units of the plant, and by analyses of the waste gases from the aerating units. The efficiency is maintained at from 75 to 80 p.ct.

Naphthalene is removed from the gas by oil in rotary washer-scrubbers, after passing through the station meters. Control of the efficiency of the removal is maintained by tests for naphthalene in the gas and oil, and by temperature and pressure records.

As regards the physical and chemical characteristics of the finished gas, wherever possible these are determined from a sample of the gas continuously collected over twenty-four hours. These tests are supplemented by frequent snatch-tests through this period. Arrangements are being made whereby the whole of the physical and chemical characteristics of the gas may be continuously determined over twenty-four hours.

The results obtained by the control department are discussed by the engineer and chemist; and an attempt is made in all cases to establish standards of efficient working. This specification of standard working has been successfully achieved in a large number of operations; and work is being developed along these lines.

A brochure is being prepared specifying the standard methods of testing for the works chemical control. Suitable methods of sampling and testing solids, liquids, and gases are also detailed. It is hoped that the publication will be generally available in the course of a few months.

THE RESEARCH AND EXPERIMENTAL SECTION OF THE CHEMICAL DEPARTMENT.

This section is organized for the development both of the carbonizing process and the utilization of the products thereof for the purpose of chemical manufacture.

Experimental carbonization trials are carried out in a coal-testing plant consisting of ten retorts capable of treating 4½ tons of coal per day. The plant is equipped completely with purification appliances, &c.; and the whole of its operations are carried through in a thorough manner, as in works' practice. In addition, research work on the economics of gas production is carried out by means of the plant. It is likewise utilized for the preparation of special grades of gas required for laboratory research purposes.

The problems investigated in the research chemical laboratory may be typified by a few which have been successfully attacked and solved, and some which are at present being investigated. Among the former may be quoted the investigation upon the removal from coal gas of sulphur compounds other than hydrogen sulphide. After investigation in the laboratory, the work was transferred to operation on a medium-scale plant (a million c.ft. per day), succeeded by a full-scale plant capable of dealing with eight million c.ft. per day at the Old Kent Road station. As a result of experience with this plant, improved plants are now in operation at all the Company's stations. Finality, however, in this subject of sulphur purification (as indeed in all scientific matters, which grow with their own growth) has been by no means realized; and the problem is being continuously investigated, and developed in the light of the results obtained.

The removal from the gas of sulphuretted hydrogen is continually under investigation and review. The efficiencies of different chemical agents for this purpose are carefully investigated, together with different methods for operating the purification process, whether intermittently or continuously. The suitability or otherwise of various artificial and natural oxides of iron, the preparation of the former in an active state, and the physical properties thereof conducing to efficiency in operation—these and allied problems are all subjects receiving examination. The restrictions placed upon supplies of oxide during the past five years necessitated much experimental work on this subject; and the result of such investigation has been to place the Company practically in an independent position so far as future supplies of purifying materials are concerned. Oxide, of activity adjusted to the peculiar requirements of any local conditions, is now available.

With regard to naphthalene removal, the suitability or otherwise of a large number of washing-oils has been investigated; and, as an outcome, the present system of naphthalene purification has been developed. Anthracene oil, specially prepared and conforming to a standard specification, is used as the washing medium, and is cyclically used—the oil being recovered subsequent to its use as an extraction medium. The process has been steadily improved, until now not more than $\frac{1}{2}$ grain of naphthalene per 100 c.ft. of gas passes into the Company's holders. The gas passing out of the holders and through the working-up mains, owing to naphthalene deposits existing therein, may contain as much as 1 grain of naphthalene per 100 c.ft. The overall efficiency of this process in all the Company's works is 93 p.ct. This condition will steadily improve with time. The effects of benzol and toluol extraction by tar and oil washing upon the naphthalene question were subjects of examination in the laboratory, in the works, and within the Company's area of supply.

The question of the recovery of a greater proportion of the nitrogen content of coal (as ammonia) is receiving attention. The Company manufacture two varieties of ammonium sulphate, of a guaranteed content of ammonia 25¼ p.ct. and 25½ p.ct., respectively. The latter, known as "Metro Sulphate," is neutral and water-free. It represents a great advance in ammonium sulphate manufacture, and is the practical outcome of a long investigation. Troubles, such as the rotting of the bags, and the caking of the sulphate, are entirely obviated by this material. Ammonium sulphite is also manufactured by the Company; and its efficient production has been investigated.

Methods of cyanogen recovery from gas have been investigated with much research along new lines. Further, sulphocyanide may be converted to ammonia if market conditions require such a procedure.

The national demands during the war for liquor ammonia (25 p.ct. concentration) were met by the erection of a plant which was in successful operation during the war period. Research work in this matter was mainly devoted to determining operating conditions whereby the percentage of sulphuretted hydrogen in the liquor could be reduced below 0·5 p.ct. The conditions determining the elimination of cyanogen, carbonates, &c., were also investigated.

During the early part of the war, the work of the department was concentrated upon the manufacture of synthetic phenol, to meet the urgent requirements of the Government. Two factories, with respective outputs of 70 and 120 tons per week, were erected and put into successful operation, turning-out a product of high-grade purity.

Among numerous other war activities may be mentioned investigations and the practical operation of plants for the extraction and purification of coal-tar products—more particularly benzene and toluene—the manufacture of concentrated sulphuric acid, and sulphuric acid by the contact process, nitric and hydrochloric acids, and the manufacture of toxic gases.

The working-up of the constituents of coal tar into intermediates and

dyes has been investigated. The initial work in each case is carried out on the small laboratory scale in glass vessels, and is then transferred to a medium-scale plant in the technical laboratory adjoining the main building—the operations therein being carried out in iron vessels. The conditions for the manufacture of a large number of intermediates and dyes have been investigated; and, as occasion presents itself, it is anticipated that many of them will be manufactured by the Company. Already plants have been erected for the making various products which the Company could, at an opportune time, manufacture. The working-up of intermediates into dyes has been investigated in a similar manner, and should it at any time be considered desirable, the Company are in a position to manufacture these materials.

A separate sub-section of the chemical laboratory devotes attention to the investigation of the problems of agriculture. In addition to laboratory experiments upon the properties of compound fertilizers produced by the mixture of various constituents, agricultural field experiments are being carried out. Agricultural advice upon fertilizers is available for farmers and others applying to the Company. Local conditions as influencing fertilizing requirements are studied, samples of the various soils being subjected to analysis, and recommendations as to suitable mixtures of artificial manures are made on the results of such analyses. In the matter of artificial fertilizers, the Company are in a strong position to meet any foreign competition which may arise in the immediate future.

Sufficient has been said to indicate the general activity of the chemical department. It hardly needs to be remarked that for the successful operation of the section, co-ordination of the activities of the subdivisions is essential. Difficulties encountered in works' practice are submitted to the research staff for elucidation; and any recommendations made by the latter are then introduced into the works' operation in question. In this manner—each helping each, and thereby being itself helped—success in overcoming many difficulties encountered in gas and bye-product manufacture has already been achieved.

PHYSICAL LABORATORY AND BURNER-SHOP.

The purpose of this department is to determine the possibilities of the utilization of gaseous energy, and to ensure that the consumer of gas within the Company's area is supplied with appliances enabling him to consume gas with efficiency and safety. Incidentally, the department co-operates with the chemical department in determining the possibilities of economic gas production. In the determination of the possibilities of gas production and utilization, many problems of a purely scientific nature have necessarily to be investigated; and such investigations of a fundamental character constitute no small part of the work of the department. These activities will be illustrated by reference to a number of recent and projected investigations. It will be noted that some such investigations partake largely of a chemical nature; and their relegation for examination either to the chemical or the physical department is decided by a consideration of the special training required for the successful prosecution of the reseach involved. There is no hard-and-fast line of demarcation between physics and chemistry; and as a necessary corollary, it follows that numerous occasions arise necessitating co-operation.

In the forefront of gas problems of the present day stands that which desires an answer, if answer can be given, to the query, What quality of gas is it that best meets the requirements of the producer, the consumer, and the nation? The question has been the subject of research by a Committee appointed by the Institution of Gas Engineers, and recommendations connected therewith have recently also been made by the Fuel Research Board. The Company have decided to attack the problem more from the fundamental standpoint than has hitherto been considered necessary; and an investigation to determine the value of the separate constituents of coal gas when used for the production of light, heat, and power is in hand. It is hoped that, as a result of the investigation, it will be possible to designate by a numerical factor the applicability and efficiency of a gaseous mixture when used in any of the ordinary operations. Of fundamental importance in this connection are such properties of flame as flame temperature, size of flame, air necessary for combustion, &c. The effect of inerts upon flame temperature, and the energy to be expended in passing such inerts through the works' mains and services are all subjects for scientific inquiry.

Experiments to elucidate the increased efficiency of the inverted, compared with the upright, burner have yielded useful and interesting results. The efficient operation of a bunsen burner is largely determined by phenomena connected with the jet of gas issuing from the injector orifice. The deposition of dust around and upon injector orifices may be mentioned as one of the matters which have been dealt with by a careful study of the kinetics of the jet.

The efficiency of a burner depends upon the nature of the orifice through which the gas issues. A thorough investigation of these problems is of considerable importance to users of gas appliances.

The radial distribution of light and heat from any source can be readily determined—the laboratory being well equipped for this purpose. The photometer installation is of the most modern kind; and, in addition, there is apparatus for determining the radiant efficiencies of gas-fires after the manner of the Leeds method.

An investigation of the vapour pressure of naphthalene has been carried out; and the results obtained have been utilized in fixing the standard of purification to which the finished gas must conform.

The subject of anemometry has received attention. The Pitot tube can hardly be regarded as a suitable instrument for general works' use—admirable as it is in the more sheltered confines of the laboratory. The possibilities of various forms of anemometers have been investigated; and contributions to the advancement of hot-wire anemometry, which promise to be of benefit to works operations concerned with the measurement of gas velocities, have been made.

Conjointly with the chemical laboratory, an investigation has been made into the composition and manufacture of radiants for "Metro" gas-fires. The mechanical strength and durability in use of the radiants all come within the scope of the investigation. The dependence of these upon factors, such as the firing temperature, have been examined. Special research has been carried out in connection with refractories used in gas-fired furnaces, retort-settings, producers, and the like. The problem of flame attrition of refractories has been the subject of particular investigation.

In addition to work of a special nature, much time and attention are given to the various domestic and industrial applications of gas, in an endeavour to improve the efficiency of gas-consuming appliances. In this connection, incandescent burners of all types are continually under observation, and the principles underlying their efficient operation investigated. "Metro" burners are constructed on the principle of fixed air and gas—there being no adjustment provided for either. In their construction, due regard is paid to the matters of interchangeability and ease of fixing and cleaning. Street-lantern burners and external lighting appliances are stardardized in like manner.

The design, construction, and performances of gas-fires are constantly under review. Thermal efficiencies, as influenced by varied conditions of gas supply, pressure, consumption, and flue-draught, are determined. The "Metro" gas-fire, like the "Metro" burner, is of the fixed air-and gas type. Here interchangeability of the parts receives careful attention; each constituent part of the fire (as in the case of the "Metro" burner) being carefully gauged. Access to working parts is a point to which special consideration is given.

Gas cooking-stoves, boiling-rings, and such like appliances are dealt with in similar manner; and new designs, possessing improved thermal and hygienic efficiencies, are being developed. The hot plate of the cooker has been entirely re-designed—regard being paid to enhanced efficiency and ease of accessibility of the various parts for purposes of cleaning, maintenance, &c. The oven has likewise received attention, and the latest gas cooking-stove developed in the laboratory represents considerable advance in this matter.

Problems of a physical nature are frequently brought to the notice of the staff by members of the Company's commercial staff. Inquiries by customers, actual or potential, as to the suitability or otherwise of gaseous fuel for particular purposes are considered; and information of value is often acquired, to the mutual advantage of the consumer and the Company.

In all the various domains of employment of the Company's appliances, special attention is given to the examination of appliances which, for one reason or another, have become defective in application. These are returned to the laboratory, and examined with a view to discovering the possible causes of failure. In this manner information is frequently obtained, by the subsequent application of which improvements have been effected in the bulk manufacture of the appliance in question. It is an axiom that most knowledge is to be derived from departures from the normal; and it is interesting in this connection to note that, owing to the careful examination of defective appliances, the percentage of revealed deficiencies is steadily reduced.

In addition to the examination of the Company's own specialities, gas-consuming appliances made by various manufacturers are submitted to careful investigation as regards efficiency in operation, and their established and reputed claims compared. Only those which reach a standard determined by the experience gained in the investigation are recommended for adoption by the Company to meet the needs of special cases. Boiling-rings, water-circulators, radiators, &c., are all subjected to an efficiency test. Their suitability as regards ease of cleaning, robustness of structure, &c., are all considered. In this manner, the interests both of consumer and Company are studied and safeguarded.

In the burner-shop, the appliances which have been developed in the physical laboratory are dealt with in bulk. The component parts are manufactured to specification, and then examined and checked by standard gauges, in order to ensure that they conform with the standard requirements. Those which fail are rejected and returned for correction. In this way, burners receive individual attention.

The perforated gas-ejector discs are produced by specially designed punches. Each ejector is carefully examined in detail. Those discs which fail to give the correct form of jet are rejected.

The hourly gas consumption of each burner is checked at the standard pressure of 25-10ths; and if, after burning for a definite period, the bunsen flame is found to be faulty, the burner is rejected, and receives further attention.

All burners are subjected to this method of testing, which is the recognized system of standardization for all "Metro" appliances.

INDUSTRIAL PROBLEMS.

The application of gas as fuel for industrial purposes is of increasing importance. The Company are called upon to consider and investigate problems relating to this branch of business.

Burners and furnaces are specially designed for particular purposes, with the object of realizing the best duties possible. In one instance gas had been tried for a particular purpose by a firm of repute, but after some months of trial was turned-down as impracticable. After carefully investigating the facts, we were able to design an appliance which surmounted the difficulties; and as a result, an installation of these furnaces has been satisfactorily working for many months.

The problem of noisy combustion—a common but most objectionable feature of coal-gas furnaces of the air-blast type—has been investigated; and considerable improvements have been made as the result of experiment.

Many of the problems with which the Company have to deal are investigated on the consumers' premises. In this way, it is found that their solution is more quickly achieved.

Popular Chemical Dictionary.—We understand that Mr. C. T. Kingzett, F.I.C., the Chairman of "Sanitas" Company, Ltd., and who was one of the original founders of the Institute of Chemistry, is preparing for early publication by Messrs. Baillière, Tindall, and Cox an abridged "Popular Chemical Dictionary" in a single volume. Apart from the educational value of such a production (including its use in schools and public libraries), it should be of great service as a work of reference not only to practical chemists but also to brokers, dealers, and business men generally who are naturally interested in the thousand and one articles finding concise description in such a book.

BIRMINGHAM GAS-WORKS DEVELOPMENTS.

The members of the Birmingham and Midland Section of the Society of Chemical Industry, to the number of forty, paid a visit on Friday, June 27, to the Windsor Street Gas-Works of the Birmingham Corporation. They were received by Dr. E. W. Smith (Chief Chemist), Mr. J. Foster (Engineer), and Mr. G. C. Pearson (Works Engineer), and conducted over the works.

Having inspected the industrial research laboratories, the party saw at work the 20-ton per day tar dehydrating plant, on which prepared tar is made for the Birmingham roads. From there the visitors went to the cyanide plant (Williams's process), which is capable of dealing with 10 million c.ft. of gas a day containing 3½ lbs. of ammonium and sulphocyanide. This plant has an efficiency of approximately 90 p.ct. The exhauster-house was next visited, and there the party saw the high-pressure gas compressors used for distributing gas at 12 lbs. pressure, and the new turbo exhausters. Passing on to the retort-houses, they saw the remainder of the horizontal retorts which are being dismantled, to be replaced by the Woodall-Duckham vertical system. In 1912 the Department installed four benches of 5-ton retorts, which have more than given the anticipated results. During the war two further benches of 7-ton retorts were installed, with end producers, and six further benches of 5-ton retorts are in course of construction. The waste gas from the new benches is passed through waste-heat boilers of the Babcock and Wilcox multitubular type. There would appear to be no difficulty in evaporating 7000 lbs. per hour per boiler through each range of retorts (consisting of two benches). When the boilers are in operation, the necessary pull on the setting is controlled by fans placed on the waste gas at the bottom of the stacks. Steaming on the retorts is in full operation; and it is found that, under normal conditions, the make of gas per ton of coal may be increased to about 17,000 c.ft. The 7-ton retorts are not, of course, novel to Birmingham—they may be seen in at least one other works; but there is novelty in the use of the end producers. Normally, 4 to 5 ton retorts have their own producer; here the producers are at the end of the setting, in improved surroundings—the gas being distributed to each of the beds of retorts, thereby effecting economies in labour costs. The 7-ton retorts are working smoothly and satisfactorily; and, but for the war, the extensions would all have been on the 7-ton basis. The yield of ammonia and tar is also increased.

The visitors were greatly impressed by the engineering arrangements, including elevators and conveyors, some of which are among the largest in the country. It was apparent to them that prior to the installation of the system a considerable amount of research work was carried out on the part of chemists and engineers alike; and that the results were achieved and maintained only by reason of scientific supervision that was carried out.

Dr. Morrell, the Chairman of the Birmingham Section of the Society, described the visit as one of the most interesting of the kind ever attended by the members; and to the works' chief officials a hearty vote of thanks was accorded.

The members of the Chemical Society of the University of Birmingham (35 in number) visited the Saltley Gas-Works on Thursday, June 26. They were conducted by Mr. Barber (Works Engineer), Mr. Darrah (Superintendent of the Coke-Ovens), and Dr. Smith (Chief Chemist). The graduates and other students inspected with great interest the coke-ovens, the Mond plant, the coal-test works, and the central laboratory. The new test installation of vertical retorts, which is nearing completion, built by the Woodall-Duckham Company, with a view to improving on already existing systems from the point of view of steaming and throughput, made a strong appeal to the party.

IMPROVEMENTS AT PLYMOUTH GAS-WORKS.

Reference was made at the annual meeting of the Plymouth Gas Company, reported in the "JOURNAL" for June 25, to improvements which are being carried out at the works. There was, however, no indication of the extensive character of the alterations which are being effected.

Some of the work now being done is in the nature of deferred repairs and extensions, which would have been carried out at an earlier date if men and materials had been available; but other parts of it mark a distinct advance, and to some extent an alteration of methods. Chief among the changes will perhaps be the connection of the works with the railway by means of a siding. It seems strange that this has not been done before, as the works lie alongside a branch of the Great Western Railway, and for a considerable distance nothing but a boundary wall divides them. The fact, however, is that though near both rail and sea the gas-works are not very conveniently placed with regard to either means of communication. The railway is on a different level from the works; but the engineering difficulties are not insuperable. As a matter of fact, the Railway Company have agreed to the construction of the siding, though it is not, as in many cases, a question of merely putting in the junction points and running out a branch line. One reason why the Gas Company have not moved earlier in the matter is perhaps that until the outbreak of war they received all their coal supplies by sea. Colliers discharged regular cargoes of Durham coal at a quay situated 400 or 500 yards from the works; and though there was a good deal of expense involved in the discharge of the coal into carts or wagons and its conveyance to the works, the total charges were so much lower than the railway rates that the idea of carrying coal by rail was never entertained. Now the conditions appear to be reversed. Mr. J. H. Ellis, the Chairman, referred at the meeting of the Gas Company to the heavy charges for freight in these days, and said that the Company had been mulcted of £4600 on six seaborne consignments of coal which they had been compelled to take. It is hardly conceivable that railway transport can continue to be cheaper than conveyance by sea to towns situated on the coast; but so long as present conditions prevail, and indeed at all times, direct connection with the railway will obviously be a great advantage.

Coming to the manufacture of gas, considerable changes are being effected in the retort-house. Ten settings are being renewed, and the size of the retorts is being increased so as to take charges of 12 to 13 cwt., compared with the present charges of 8 cwt. The retorts are in settings of nine, and are 20 ft. long. Those now in use are 20 in. by 15 in., and the new ones will be 23 in. by 16 in. A change is also being made in the stoking machinery. A De Brouwer projector was put in some time ago, but has seen little actual service. It is now intended to instal a pusher of the same make, so as to deal with the heavier charges; and the projector will then be brought into regular use.

The water-gas plant is undergoing reconstruction, so as to increase the output. Messrs. Davison & Partner are at present enlarging two of the four generating sets; and on the completion of these, the other two will be taken in hand. The new generators are 10 ft. 6 in. in diameter, as compared with 8 ft. 6 in. at present. The carburettors and superheaters will remain as at present; but the effect of the changes will be to increase the total capacity from less than 3 million c.ft. a day to over 5 millions.

An entirely new work will be a telpher installation, by Messrs. Strachan and Henshaw, of Bristol. This will supersede the present coke-conveyor, and is to be so arranged as to carry coke and other material to various points of the works to which it has now to be carted. The sulphate of ammonia plant is being reconstructed. A new saturator is being put in by Messrs. Joseph Taylor & Co., of Bolton; a centrifugal drying apparatus by Messrs. Pott, Castle, & Co.; and a pulverizer by Calvac, Ltd. With this new plant in operation, it is anticipated that the salt produced will be of a distinctly higher grade, quite free from acid, and of a fineness suitable for agricultural drilling machinery; while the total output will be increased.

Another important extension now in hand is that of the electricity plant. Very large and increasing use is made of electricity for motive power; and it is doubtful whether any gas-works of the same size in the United Kingdom employs it more extensively. There are forty points on the works where electric motors are in use; and the number is being increased as opportunity occurs to instal electricity in place of steam power. The change which has been wrought in this direction has been very marked in recent years. In 1912 electricity was used to the extent of about 150 H.P. To-day it is equivalent to 450 H.P. The current is generated on the works; and as none but the lower-grade fuel is employed for the purpose (small breeze and dust which are practically unsaleable), its cost comes out at only about ¼d. per unit, which is one-third the lowest price charged for supplies from the municipal electricity undertaking. A remarkable fact in connection with the production of electricity at the gas-works is that, while the output has increased threefold in the last seven years, the fuel consumption has not increased at all, but is really a little less. There are eight boilers in use, each 30 ft. by 8 ft., and all of Adamson's make. They are fitted with Wilton furnaces, and raise steam in a very satisfactory manner.

The extension of plant now to be carried out includes the installation of a 250 K.W. generating set, by which the productive capacity will be increased to about 1,000,000 B.Th.U.

The extension and improvements in progress, great as they are, are not confined to the works. Distribution is also receiving attention. Some important work of this kind was carried out last year, and this year a start is being made with the laying of a 24-in. main to the Mutley district. This will take the place of a 15-in. main at present in use. The total length is about 1¼ miles.

Temporary Increase of Charges Act—Applications have been made to the Board of Trade for Orders under the Statutory Undertakings (Temporary Increase of Charges) Act by the Brynmawr and Blaina Gas Company, the Isle of Wight Water-Works Company, the Mid Kent Water Company, the Liverpool Gas Company, the Liverpool Hydraulic Company, and the United District Gas Company. The Board of Trade have made Orders under the Act in favour of the Credition Gas Company, the Denbigh Water Company, the East Kent District Water Company, the Hawkhurst Gas Company, Ltd., the Hayling Island Gas Company, Ltd., the Richmond Gas Company, the Sittingbourne District Gas Company, the St. David's Water and Gas Company, the Truro Water Company, and the Westgate and Birchington Water Company. The Tiverton Corporation have applied for an Order to the Ministry of Health (as the successors of the Local Government Board).

ALCOHOL AS A MOTOR FUEL.

Report of the Inter-Departmental Committee.

There was issued last week a progress report on various matters concerning the production and utilization of alcohol for power and traction purposes, by the Inter-Departmental Committee appointed in October last by Mr. Walter Long, as Minister in Charge of the Petroleum Executive. The Chairman of the Committee was the late Sir Boverton Redwood, Bart., and among the members were Prof. Harold B. Dixon, C.B.E., F.R.S., and Dr. W. R. Ormandy—with Mr. E. S. Shrapnell-Smith as Secretary. One of the matters the Committee had to consider was the suitability of alcohol, either alone or in admixture with solid, liquid, or gaseous combustible substances, for use in internal combustion engines, and the modifications in existing types of engines which such use might necessitate.

In 1904, a Departmental Committee on Industrial Alcohol unanimously expressed the opinion that the question of the use of spirit for motor vehicles would be one of price, and that close investigation of the matter might be delayed until such time as there might be an approximation between the prices of petrol and spirit sufficient to create a practical alternative of choice between the two. It is clear to the present Committee that this condition is now in sight. While admitting it is impossible to forecast the development of the total petrol consumption, they say that facts are not wanting to indicate the likelihood in the not-distant future of a demand which will cause a very high level of prices; and close investigation into alternative supplies should now proceed. In view of statements to the effect that some sections of the community take the words "industrial alcohol" to refer to an inferior spirit for drinking purposes, the Committee recommend that all alcohol for power or traction should be described as "power alcohol."

The Committee, after declaring they are satisfied the time has come for Government action—which should pay due heed to both current and prospective prices for petrol, or other petroleum products, benzol, and alcohol motor fuel, or its admixtures—refer to the research and experiments that have been carried out. Prof. H. B. Dixon, in the Chemical Laboratories of the Manchester University, is still engaged in providing accurate data concerning the behaviour of alcohol, alcohol-benzol, alcohol-ether, and other alcohol-mixture vapours, upon their combustion with different volumes of air, and with varying percentages of water and denaturants; and a commercial-scale trial of alcohol-benzol and alcohol-benzol-petrol mixtures for motor-omnibuses is at the present time proceeding.

Exhaustive technical evidence was taken from representatives of the Ministry of Munitions concerning the investigations made by them during the war in respect of the extraction of ethylene from coal and coke-oven gases. Lord Moulton was present at one meeting when this subject was considered in relation to future output, and the synthetic conversion of the ethylene into ethyl alcohol. The evidence and records of work done indicate that there is thus available in Great Britain a large potential source of power alcohol; but, though synthetic production is promising, further investigation is necessary—particularly as regards the conversion of the ethylene into alcohol—before definite figures as to quantities and price can be given.

Other sections of the report deal with vegetable sources, denaturants and denaturing, importation and distribution, and future State action to develop production and foster utilization. The Committee recommend that a permanent organization should be established by the Government to initiate and supervise experimental and practical development work on the production and utilization of power alcohol. This organization should be fitted to deal with alcohol in conjunction with other fuels available as sources of power.

HIGH-PRESSURE GAS DISTRIBUTION.

At a meeting of the New Jersey (U.S.) Gas Association the advantages of high-pressure distribution were discussed in a paper read by Mr. B. Frank Buck, who has charge of a gas undertaking, producing capacity 1,200,000 c.ft. per twenty-four hours, and supplying an area including several townships. The distribution in the home districts was by ordinary pressure, and in the outlying districts by high pressure.

Troubles incidental to the ordinary system were mains laid many years ago—in the first place not equal to modern requirements, and subsequently settled out of level or charged with accumulated deposits. In course of time, there was quite a pyramid of such matter, at the connection of services that were frequently blown-out. Larger mains, district distributing stations belting the old system with a high-pressure trunk-main, and feeding district governors, had been tried. The last-named plan was efficient and economical; but there was trouble due to the deposition of liquids at the district governors, produced by expansion of the gas when the pressure was reduced. Small mains caused shortage at times of large demand.

His experiences favoured an entire high-pressure system with house reducing governors. A small holder at the works, set at a pressure slightly in excess of the working load on the main, or a small pump that would return any excess pressure to the holder, was an advantage, but not a necessity. The supply of a large part of his district would be impracticable without this system. Less holder capacity was required on a long run of main charged at 16 lbs. to 25 lbs. pressure, as it represented a storage exceeding that of a 500,000 c.ft. gasholder. For various reasons, sections of the mains required renewing. He had valves at half-mile distances throughout the district, and found it quite possible to cut out a distance between two valves for twenty-four hours or more without affecting any other parts. The pressure in the pipes would take care of the consumption in the district isolated from the supply. The house governors were set at 40-10ths, which ensured a uniform supply pressure, no trouble in the way of shortage at times of peak loads, and a wide variation as regards the installation of additional appliances, before a larger meter or service need be considered. Frequent complaints of poor supply were entirely avoided; and any trouble that way was exceptional, and due to failure or defects in appliances. There was practically no pumping or blowing-out of services—condensation or naphthalene being very rare. The pipes and connections being smaller throughout, the cost of installation was less.

Mr. Doig Gibb Ceases Work at the Ministry of Munitions.

The position as Technical Adviser which Mr. Doig Gibb has so conscientiously, and with good effect, occupied at the Explosives Supplies Department of the Ministry of Munitions came to an end about the middle of last month; but he is retained as Consulting Engineer for an indefinite period. The gas industry realizes how valuable was the presence in the Department of one with such a wide knowledge as Mr. Gibb of the affairs technical and commercial of the gas industry, and of its war-time difficulties. We know that he rendered yeoman service during his tenure of office; and if he had not been there, things would, we fully believe, have been much worse. His knowledge of both sides enabled him to advise so that the balance was held as fairly as circumstances would allow between the department and the industry. Lord Moulton recognized the merit of Mr. Gibb's work, by expressing in a personal letter his high appreciation of the value of his services to to the department and to him personally as its head. We should like to quote more from the letter, but dare not, as it would only be embarrassing to the recipient. We may, however, say that Lord Moulton's acknowledgment is something on which Mr. Gibb will, we are sure, always look with pride. Mr. Gibb is continuing his private consulting work. In the autumn he will take a well-deserved holiday; and thereafter will be establishing an office in London. Meanwhile communications should be addressed to his private residence—166, East Dulwich Grove, London, S.E. 22.

Gas Instead of Coal in a Famous Restaurant.

Mr. Louis Resnick recounts in a readable manner, in the pages of the "American Gas Engineering Journal," the circumstances attending the substitution of gas for coal fuel in a big St. Louis restaurant. The restaurant is the famous Bevo Mill, on which a sum of $200,000 has been spent; and it is noted particularly for roast chicken dinners. One day Mr. C. L. Holman, the President of the Laclede Gas Light Company, of St. Louis, happened to be lunching there when he perceived the disadvantages of a plentiful supply of fine coal ash; and he immediately interviewed the manager of the place (Mr. Henry Dietz), with the result that a conference was arranged for the next day. In the first place, it was emphatically laid down that the picturesque appearance of the place was not to be detracted from by replacing the glowing coal-fire with artificial gas-flames; so that the problem resolved itself into one of producing with gas a coal-fire effect that would not be apparent even to the closest observer. An experimental gas-fire rotisserie was set up in the Gas Company's laboratory; and for seven weeks tests were made daily—the appliance being tested for utility, appearance, economy, speed, gas consumption, and efficiency in the roasting of chickens. After more than forty hours of actual operation in these tests, a perfect coal-fire effect was obtained through the use of "clay doughnuts," and certain adjustments of the seven blast-burners by which the rotisserie is fired. To make the conversion, it was merely necessary to instal the burners, to fill the coal-grate with the "doughnuts," closely packed, and to adjust the air-regulators on certain of the burners in such a way that a small blue flame appeared just above the pile of "artificial coal." From the point of view of cleanliness, as a labour saver, and for speed and uniformity in roasting chickens, it cannot, Mr. Dietz says, be compared with anything he has seen in the United States or in Europe in twenty-five years of experience as a chef. The operation of roasting can be started in less than fifteen minutes; and two months' working has demonstrated that, without considering other advantages, there is a decided saving in fuel. The maximum consumption is 50 c.ft. per hour per burner; but all seven burners are used only for a few minutes to fire-up. After this, two burners half-on are sufficient to roast twenty chickens at one time. The cost of fuel is little more than 2½c. per hour.

The 1919 Convention of the Illuminating Engineering Society of America will be held at the Hotel Sherman, Chicago, on Oct. 20 to 23 inclusive. The Chairman is Mr. Homer E. Niesz.

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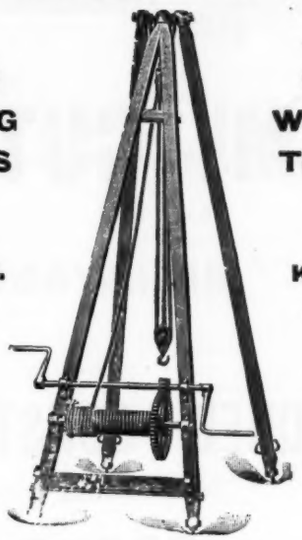

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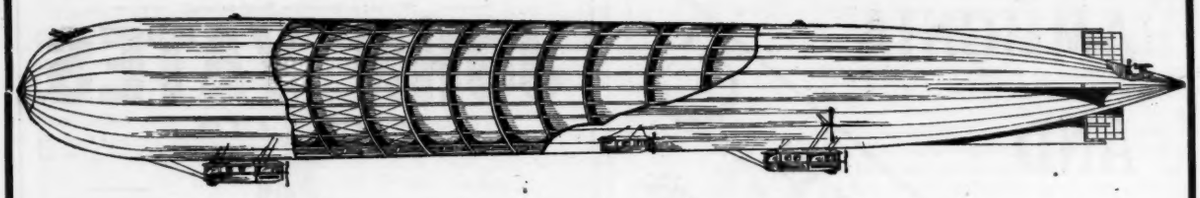

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CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Mr. Smith's Colwyn Bay "B.C.G.A." Paper.

SIR,—Referring to your criticism in last week's "JOURNAL" on my remarks in opening the discussion on gas service in "National Housing Schemes."

The matter published was not that given entirely, but extracts from which quotations were made at varied length. Due credit was given to the original in all cases; but mention was not made of any particular firm, with a view to eliminating any ground for criticism.

If your reporter had been present at the meeting, I scarcely think the reflection would have been found necessary. No one was more surprised than myself to see the discussion openly published in the form it was, and for which I am not responsible. The only report of the proceeding given by me was to a local reporter, who had been requested by your contemporary to attend; and from this you will see that all criticisms on "plagiarist" lines are groundless.

This, to me unhappy, incident has purely arisen through an incomplete report of what I trust was a profitable afternoon transaction.

Colwyn Bay, July 4, 1919. J. SMITH.

[Our correspondent has entirely missed the point of the criticism levelled against his action in appropriating in his paper—without acknowledgment of the source from which he obtained it—much matter that had already been published in our columns. Readers can easily see for themselves how much Mr. Smith "lifted" from the article we published on March 4 by comparing the portion appearing on pp. 448-9 of that issue (under the sub-heading, "Boiler on Usual Circulating System, with Storage Cylinder," with the section of Mr. Smith's paper, with the same sub-heading, given on p. 814 of the "JOURNAL" for June 24.—ED. G.J.]

REGISTER OF PATENTS.

Convertible Gas and Coal Domestic Grate. No. 126,811.

PETERSON, J. M., and MEREDITH, J., of Wylam-on-Tyne.

No. 8369; May 21, 1918.

This invention has for its object to provide appliances whereby a grate may be more readily and more conveniently than hitherto adapted to use either coal or gas for heating purposes.

It is proposed to superpose the gas-grate and appliances upon the fire-grate, the appliances for the use of gas and the provision of a gas-fire being pivotally mounted upon the back of the coal-fire grate in such a manner that, when it is desired to use a coal-fire in the lower grate, the gas-fire appliances are swung back into a space or recess provided at the back of the coal-fire grate. The invention further consists in the arrangement of gas appliances and the means whereby the gas-fire is rendered effective when this heating means is pivotally swung forward into position.

Atmospheric Gas-Heating Burners.—No. 126,818

CASBON, W., and DUNKINSON, A. J., of Hitchin.

No. 8575; May 23, 1918.

In patent No. 17,089 of 1915, the inventors described a lighting burner wherein a baffle is combined with a tube in such a manner that the mixture of gas and air passing from the usual mixing chamber strikes, and passes around, it, and through a series of holes or apertures into the burner tube, whereby a further mixing of the gas and air is effected before the mixture reaches the point of combustion. It is the object of the present invention to apply this construction to burners for heating muffle and other furnaces for industrial purposes.

For this purpose, instead of being of larger diameter than the burner tube, the baffle is of less diameter, so that it can be inserted into the tube of an ordinary burner without the formation of a box or enlargement. The baffle is carried upon a plate designed to be fitted into, and fixed in, the burner tube, while suitable openings are provided in the shank between the baffle and the plate for the passage of the gas.

Recovering Cyanogen Compounds and/or Sulphur from Spent Oxide.—No. 127,128.

ANDERSON, W., of Helensburgh, N.B.

No. 9888; June 15, 1918.

This invention relates to the recovery of sulphocyanides and ferrocyanides and/or free sulphur from spent oxide which has been utilized in the purification of coal gas.

The patentee says: Broadly, the invention consists in subjecting the spent oxide simultaneously to the action of a solvent and to the action of centrifugal force. In practice, the spent oxide is first centrifugalized in the presence of one solvent—say, water—and is then centrifugalized in the presence of another solvent, say, bisulphide of carbon. Naturally, if it is desired to recover only matters soluble in one solvent, a single treatment will suffice.

The spent oxide is introduced into a centrifugal machine, of the usual hydroextractor type and preferably driven by a steam-turbine, the exhaust steam from which is passed through the material and allowed partially to condense thereon, whereby the water-soluble sulphocyanides and like matters are extracted, dissolved in the water of formation, and the sulphocyanides recovered from the liquor by crystallization.

After the extraction of the water-soluble compounds, bisulphide of carbon vapour, or a mixture of the vapours of bisulphide of carbon and benzol, is passed through the material, preferably along with steam, while the centrifugal machine is kept in motion; the vapour and steam being allowed to condense and the condensate run off, the free sulphur thus dissolved being recovered by evaporation of the solvent.

To recover the ferrocyanides, ammonia vapour is then passed through the material which is still subjected to the action of centrifugal force, so as to form, with the ferrocyanide, the compound ferrocyanide of ammonium which may be recovered as such, or by the addition of potash or soda to the ammonium salt) it may be recovered in the form of ferrocyanide of potash or sodium by crystallization—the ammonia being recovered for further use. After treatment as described, the oxide of iron is available for use in further processes.

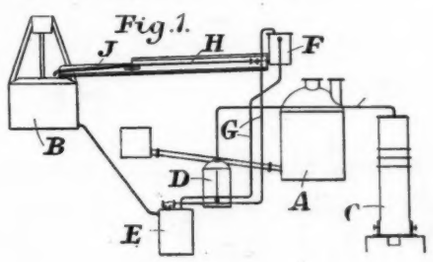
The installation for the extracting operation and recovering the solvent may be described in a pending patent, No. 122,477.

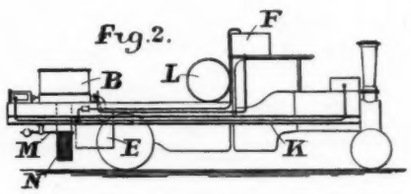
Manufacturing Sulphate of Ammonia. No. 127,398.

WILTON, N., of Hendon.

No. 8812; May 28, 1918. No. 10,452; June 25, 1918.

This combined invention relating to the manufacture of sulphate of ammonia has for its object "to provide a rapid and economical process for this purpose." It consists in directly neutralizing the acid in the acidulated crystals with ammonia by treatment with a cold ammoniacal solution of ammonium sulphate, saturated, or practically saturated, with this salt; the degree of alkalinity of the solution being sufficient to neutralize completely the acid in the crude crystals, and not substantially below 1 p.ct. of free ammonia. Preferably acid ammonium sulphate—for example, the drainings from an ammonium sulphate plant—is treated with pure ammonia solution to obtain the ammoniacal solution of ammonium sulphate.





Wilton's Sulphate of Ammonia Plant.

Fig. 1 is a diagrammatic elevational view of the plant in combination with an ammonium sulphate plant; fig. 2 shows apparatus for converting acid ammonium sulphate into neutral ammonium sulphate, mounted on a wheeled vehicle.

A is the saturator in which ammonium sulphate is formed in the usual way by introducing ammonia from the gas-producing plant into sulphuric acid contained in the vessel. The sulphate is passed to a centrifugal drying machine B, where it is dried as far as possible in the usual way. The ammonia generator C comprises a vertical vessel having means for the introduction of ammonium sulphate and lime, means to heat the mixture, and (preferably) a condenser through which the ammonia as generated is passed. The generator is connected to a pair of earthenware vessels D. These vessels are connected to a tank E, which communicates with a second tank F by pipes G. The tank F is preferably arranged at a level higher than the drying machine B. A pipe H connects the tank F with rubber hose J extending to the centrifugal machine B.

In operation, ammonium sulphate is introduced into the generator C, together with powdered lime, and the mixture is heated. Pure ammonia is thus generated, which, after passing through the condenser mounted on the top of the vessel C, is introduced into water in the vessels D. Thus a 10 to 15 p.ct. pure ammonia liquid is produced. Into the tank E is introduced also a quantity of ammonium sulphate solution—for example, cold mother liquor from the saturator, or a solution made by dissolving some of the acid ammonium sulphate in water. The pure ammonia liquid formed in the vessels D is then introduced into the tank E so as to render the liquor therein alkaline to the required degree. This cold alkaline liquor is pumped or forced-up into the supply tank F.

After a charge of acid ammonium sulphate from the vessel A has been dried in the centrifugal machine B, a quantity of cold alkaline saturated (or substantially saturated) sulphate solution from the supply tank F is run into the centrifugal machine. The alkaline sulphate neutralizes the acid in the charge, whereby a neutral ammonium sulphate is produced, which is practically dried in the centrifugal machine, and may be then stored or packed for transport.

In a plant manufacturing 5 tons of sulphate of ammonia in twenty-

four hours, it is found convenient to take cold mother liquor from the drainings, and place it in the tank E containing about 1 ton. To the liquor, which will often contain about 3 p.ct. of free acid, is added sufficient liquid ammonia to free it from impurities, and to render it alkaline to the required degree. This liquid is elevated to the supply tank F, which is preferably of such a size as to contain just sufficient for the washing of a charge of acid sulphate in the centrifugal machine.

The washings from the centrifugal machine are run off; and they may, if desired, be returned to the tank E, in which the sulphate liquor has already been rendered alkaline.

In fig. 2, the apparatus for neutralizing acid ammonium sulphate is mounted on a wheeled vehicle K. There are means whereby the engine may be coupled and uncoupled from the road wheels of the chassis, so as either to be available to propel the vehicle or to serve for other purposes. Upon the chassis are mounted the centrifugal drier B, and three tanks one above the other. The lowest tank E is below the level of the bottom of the centrifugal drier B; and the highest tank F is higher than the top of the centrifugal drier, so as to allow liquid to gravitate from the higher tank to the drying machine, and thence to the lower tank. The intermediate tank L may be at any convenient level. Gearing and clutches are provided whereby, when the engine is disengaged from the road wheels, it may be connected to the centrifugal machine B. A weighing machine M is provided on the under side of the chassis K, to support bags N to receive the sulphate of ammonia from the drier B; and it is preferably so constructed that, as soon as a bag held by it has been filled to a predetermined weight—for example, 2 cwt.—it automatically cuts off the discharge from the drying machine. This forms a convenient portable apparatus for producing neutral ammonium sulphate and also for distributing it to farmers or other consumers, as desired.

Effecting Intimate Contact between Liquids and Gases.—No. 127,705.

KIRKHAM, HULETT, AND CHANDLER, LTD., and HERSEY, S., of Norfolk Street, London, W.C.

No. 9005; May 31, 1918.

This invention for effecting the extraction of ammonia and other impurities in gas is of the class of apparatus described in patent No. 18,129 of 1908.

Fig. 1.

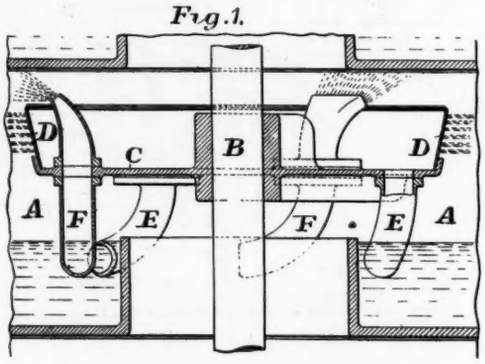
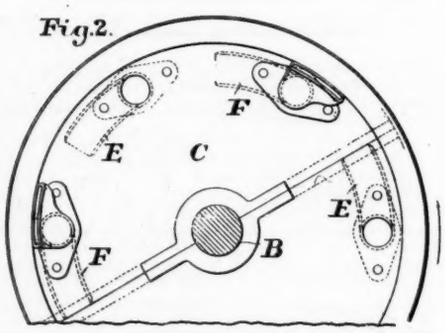


Fig. 2.



Kirkham, Hulett, and Chandler's (Hersey's) Gas Purification Plant.

The present invention consists in the provision of means whereby any remaining non-effective area of the plant is made use of for cleansing purposes. To this end a revolving tray is furnished with a series of pick-up tubes, which extend up from the bottom and beyond the top level of the perforated rim—the portion of the tubes which projects beyond the rim being preferably splayed and perforated. Therefore, the spraying area is extended beyond the level of the top of the perforated rim, to an extent which depends upon the depth of the spray issuing from the projecting portion of the spraying tube. The pick-up tubes may, below the bottom of the tray, be formed with perforations or slits as described in patent No. 7958 of 1913. They may also be closed at their top ends.

Fig. 1 is a sectional elevation of part of the apparatus embodying one form of the invention. Fig. 2 is a plan.

A is one compartment of apparatus described in the 1908 patent; B being the vertical shaft extending through it; and C the tray mounted in the compartment A and having a perforated periphery D. E are the spraying tubes which depend from the bottom of the tray, and which pick-up liquid from the bottom of the compartment, whence it passes into the tray and is projected through the perforated periphery under the action of centrifugal force, as described in the former specification. F indicates the pick-up tubes, which are designed to project the spray through the space in the compartment A between the top of the tray and the top of the compartment. Then, pick-up tubes are shown alternating with the pick-up tubes E and the upper part of each of the tubes F—that is, the part which extends through the tray C—is curved or bent outwardly; its upper end being approximately at the level of the top of the rim of the tray, so that the liquid which is collected at the bottom of the tube is discharged from the open upper end in an outward and upward direction, as indicated, "so as to permeate the space above the revolving tray with spray."

Alternative forms of the plant are described and illustrated in the specification.

Manufacture of Sulphate of Ammonia. No. 127,715.

LINDER, S. E., of Buckhurst Hill, Essex.

No. 9128; June 3, 1918.

According to this invention, a fixed alkali or an alkaline earth, or a carbonate of an alkali metal or of an alkaline earth metal, is added to the solid sulphate of ammonia in order to effect the neutralization of the free sulphuric acid contained in it.

When producing neutral sulphate of ammonia by the employment of a fixed alkali or an alkaline earth or the corresponding carbonates, the minimal suitable proportion of the neutralizing substance may be added to the sulphate of ammonia, which is in the dry or moist condition, and mixed with it. The admixture may be conveniently effected, the patentee remarks, in a closed mixer provided with mechanical means for agitating its contents; and the treatment may be effected at, or somewhat above, the atmospheric temperature, in order to permit the chemical reactions to take place.

The neutralizing agent is conveniently added in the powdered form; but, if desired, a solution of a neutralizing agent may be employed, and the treatment be effected by the employment of the neutralizing agent partly in the solid form and partly in the form of a solution.

Of the substances suitable for effecting the desired neutralization, caustic soda, lime, and magnesia in the anhydrous or hydrated form may be mentioned; as also may be the sodium, calcium, and magnesium carbonates.

As an example of a method of carrying the invention into effect, the following particulars are given: To 100 lbs. of sulphate of ammonia containing 0·5 p.ct. of free sulphuric acid, 0·5 lb. of slaked lime is added, and the whole is thoroughly mixed.

Manufacture of Sulphate of Ammonia. No. 127,716.

LINDER, S. E., of Buckhurst Hill, Essex.

No. 9129; June 3, 1918.

According to this invention, an ammonium salt which, by double decomposition with the free sulphuric acid, will yield an acid volatile under conditions of manufacture is added to the hot liquor which has been concentrated by evaporation to the crystallizing point, prior to the removal of the crystalline sulphate of ammonia from the liquor.

Preferably, the bulk of the free acid contained in the liquor is neutralized prior to evaporation by passing a supply of ammonia gas free from sulphuretted hydrogen or other noxious or offensive gas through the liquor until the free acid is wholly or approximately neutralized.

The ammonia gas employed is conveniently taken from an appropriate section of an ammonia still, and the ammonium salt employed for the purpose of neutralizing the acid is added in the solid form or in solution, or partly in the solid form and partly in solution.

Of the salts specially suitable for employment in accordance with the invention, the sulphite or acid sulphite of ammonia or products containing such sulphites, are mentioned by the patentee.

As an example of a suitable method of carrying the invention into effect, the following particulars are given: A solution of sulphate of ammonia is approximately neutralized by passing ammonia through it; and the neutral solution is introduced into an evaporating vessel, where it is concentrated to the crystallizing point. At this stage, 1 lb. of ammonium sulphite is added for each 1 cwt. of sulphate of ammonia contained in the evaporating vessel. It is, however, to be understood (the patentee points out) that the quantity of salt employed as the neutralizing agent will depend upon its composition or purity and the amount of acid formed in the evaporation.

Another Successful Year at Hinckley.

The Hinckley Gas-Works this year record a net profit of £1660. The annual report of the Manager (Mr. Fred Lee) shows that the amount placed to the sinking fund was £1701; and loans amounting to £825 had been repaid during the year. The total owing on loan account was £19,088, which was equal to 3s. 2d. per 1000 c.ft. of gas sold. Receipts for gas were £18,288, compared with £15,882 last year; the average increase in price being 3·62d. per 1000 c.ft., or 10·86 p.ct. This increase was necessary owing to the cost of labour, coal, and other materials. The average price of gas during the past year was only 23·34 p.ct. more than the average price for the year ended March, 1914. The total income was £4123 more, and the expenditure (including £1500 for special renewals) £4387 more, than last year. The balance of revenue account, after paying interest, &c., was £1660, compared with £1894 last year. The gas sold was 118,831,500 c.ft., compared with 112,992,300 c.ft. last year—an increase of 5,839,200 c.ft. or 5·16 p.ct. Gas unaccounted for was 2,246,400 c.ft., or 1·83 p.ct., which was a little higher than last year, but still remarkably low. The year under review had been one of great anxiety, owing to the difficulty of obtaining materials and labour; and so satisfactory a report would not have been possible, but for the policy of the Committee in conserving the resources of the undertaking for many years. This was now enabling the Council to sell gas cheaper than many works.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Stocksbridge Gas Bill was read a second time, and committed.

The Standing Committee reported that the Standing Orders not complied with in respect of the petition for additional provision in the Pembroke Gas Bill ought to be dispensed with, and leave given to insert the additional provision. The report was agreed to.

The Dover Gas Bill was reported, with amendments.

HOUSE OF COMMONS.

Progress of Bills.

The South Yorkshire Joint Line Committee have withdrawn their petition against the Swinton and Mexborough Gas Board Bill.

Standing Orders not previously inquired into have been complied with in the case of the Huddersfield Corporation Gas Bill and the Stockton-on-Tees Corporation Bill.

The following Committee has been appointed to consider the Swinton and Mexborough Gas Board Bill and the Gas and Water Provisional Orders (Elstree, &c.) Bill, to meet this [Tuesday] morning: Sir Charles Hanson (Chairman), Sir Harry Brittain, Mr. Gange, and Mr. Alfred Short.

In the case of the Ammanford Gas Bill and additional provision in the Pembroke Gas Bill, it was agreed to dispense with the Standing Orders, and permit the Bills to proceed.

The Sunderland Gas Bill was reported, with amendments.

The Hartlepool Gas and Water Bill was read the third time, and passed, with amendments.

Ammanford Gas Bill.

The Ammanford Gas Bill, "to authorize the acquisition by the Ammanford Gas Company of the undertaking of the Garnant Gas Company, to confer further powers on the Ammanford Gas Company, and for other purposes," was presented, read the first time, and referred to the Examiners of Petitions for Private Bills.

American Coal for Europe.

Mr. BRIDGEMAN, replying to a question addressed to the Prime Minister by Sir Henry Norman, said he understood that it was the fact that contracts had been made for American coal for delivery to European ports. The cost of American coal delivered in European ports was at the present time higher than that at which British coal could be supplied, owing to the higher rates of freight from America. There was no restriction in the importation of coal; but American coal could only be delivered in this country at a very much higher price than that at which British coal was now obtainable.

Price of Fuel and Gas Oil.

Sir A. GEDDES, replying to a question by Mr. Cautley, said that the Orders fixing the wholesale prices of petroleum products ceased to have effect as from May 7 last, and there was now no minimum price applicable to the sale of fuel and gas oil.

WAR CLAUSES IN PRIVATE BILLS.

Although apparently the Treasury is not now insisting upon the insertion of the clause which has been common in Private Bills during the war—that no capital should be raised without its consent—there does not appear to have been any definite policy laid down. The clause still appears in some Bills; in others, the Treasury has not insisted upon it when asked; while in others, no definite answer has been given to the parliamentary agents. As the restrictions on the raising of capital generally have been removed, there is no sound reason for putting gas and similar parliamentary undertakings to the inconvenience of obtaining Treasury consent to the issue of capital. Moreover, the clause refers to the "present" war; and with fighting still going on in various parts of the world, the insertion of the clause after the termination of the great European war, which is the one really referred to, might lead to difficulty in interpreting the precise meaning. However, it is clear that the Treasury does not require the clause; and it would be as well for a definite and general ruling to be given to this effect. It would save discussion before Committees, anyway. In the same way it is no longer necessary to have the special clause dealing with residual products which has been inserted in Gas Bills during the war; and in this case the Model Clause is being reverted to.

SUNDERLAND GAS BILL.

The Bill promoted by the Sunderland Gas Company was before the Unopposed Bills Committee of the House of Commons on Wednesday last—Mr. WHITLEY (the Deputy Speaker) in the chair.

Mr. SEAGAR BERRY (Messrs. Sherwood & Co., Parliamentary Agents) said the powers sought in the Bill were of the usual kind in the case of a gas company which had not been before Parliament for some years. It sought power to use further lands as gas lands, to extend the limits of supply, to consolidate the capital, and to raise further capital. The Bill also included the usual form of benefit fund provision, and other clauses from the Model Bill for bringing the Company up to date. Incidentally, the Company asked to have legalized the fact that they had somewhat extended their boundary in building their gas-works, and had also laid some mains for a very short distance in two parishes outside their limits. The Bill had been very closely scrutinized by the Corporation of Sunderland; and the £200,000 additional capital originally asked for had been reduced to £120,588, in order to meet the Corporation views. In addition, a clause had been inserted to the effect that if in the next session of Parliament the Corporation should promote a Bill to purchase the Company's undertaking, the Company should not oppose on the principle but only on the details. So far as the Treasury clause was concerned, it was in the Bill; but he understood the Treasury did not now insist on its insertion. In a late Bill he had the other day, though the Treasury previously asked for the clause, they did not finally insist upon its insertion. He therefore asked the Committee to strike it out.

The CHAIRMAN said he thought, before the clause was taken out, it would be best to get the consent of the Treasury. The matter could then be dealt with on the consideration stage.

In answer to the CHAIRMAN, Mr. Berry said the Company had a standard price; but it was not proposed in the Bill to alter this.

Mr. *W. D. Mann*, the Solicitor to the Company, formally proved the preamble of the Bill, and the measure was ordered to be reported for third reading.

BOURNEMOUTH GAS AND WATER BILL.

House of Lords.—Thursday, July 3.

(*Before the Duke of* NORTHUMBERLAND, *Chairman, Viscount* HOOD, *Lord* ST. LEVAN, *Lord* ABERDARE, *and Lord* HINDLIP.)

The main object of this Bill, promoted by the Bournemouth Gas and Water Company, is to extend their gas-works in Poole. The Bill has already been passed by the House of Commons.*

Counsel for the Bill were Mr. J. G. TALBOT, K.C., Mr. W. B. CLODE, K.C., and Mr. ARTHUR MOON. The only opponents, the Poole Corporation, were represented by Sir LYNDEN MACASSEY and Mr. TYLDESLEY JONES.

Mr. CLODE, in opening the Bill, related the same facts as were given in the other House. Briefly, the proposal was that, owing to the rapidly increasing growth of the Company's business, it was necessary to extend the works which are situated on the quay at Poole. To extend on the existing site was impossible, owing to the necessity for acquiring a large amount of property and displacing a great number of people. A short distance away from the works the Company had already unrestricted powers to erect gas-works on certain land, and restricted powers on certain other land adjoining; the restriction on the latter being that gas-making plant must not be erected, according to the terms of a lease held under the Corporation. In the other House, a compromise was arrived at, on the suggestion of the Committee, that the unrestricted powers should be abandoned; the reason being that if gas-works were erected upon these lands they would be closer to residential property than if they were erected upon the lands in regard to which the Company were at present restricted. On the latter, there is already a gasholder; and as the Bill left the House of Commons, the Company were given full powers to erect gas-works on a portion of the latter land at the northern end furthest removed from the residential property. In order to connect the existing works with the other site, the Bill also gave powers to erect an overhead cableway for carrying coal, as the only access to the quay for obtaining supplies was through the existing works—the new land not having water facilities. This compromise was on the suggestion of the Committee, and was put into the Bill. The Corporation of Poole, however, still opposed the scheme.

Sir LYNDEN MACASSEY said he had had no opportunity of giving evidence against the compromise in the other House.

Mr. CLODE said the position therefore was that, as the Bill now stood, the Company had voluntarily given up certain unrestricted powers to build works; but it was a condition in the other House that, in return for this, they should have unrestricted powers upon the other piece of land to which he had referred. He was pleased to say that the many questions raised in the petition of the Poole Corporation with regard to standard price, &c., were not now pressed. The general case for the opposition was that the extensions proposed were not required for supplying the borough of Poole. At the same time, it was suggested that the existing works could be extended by projecting the present site along the quay to the west; but this proposal the Company's advisers regarded as impossible. In the other House, some property owners opposed, but did not now appear.

Mr. *William Cash*, the Chairman of the Company, said that if the Bill did not pass in its present form the Company would be compelled to put up gas-making plant on the piece of land over which they had unrestricted rights, and then they would be quite close to the High Street. The land over which the Bill gave unrestricted rights now, and which already contained a gasholder, was for the most part reclaimed mudland. So far as the conveyor was concerned, this was the only means of carrying coal either over the land over which the Company already possessed rights or the other land, unless it was carted through the streets by vans; and then the possibility of nuisance would be far greater. The only other method of extending the works was to do as the Corporation suggested, and go to the west. But this would involve absorbing several public houses, a large number of dwelling houses, and a pottery; and there was little doubt that such a proposal would evoke a storm of opposition. The Company had approached the owners of the pottery works; but the price asked was prohibitive.

Friday, July 4.

Witness was cross-examined by Mr. TYLDESLEY JONES for the Poole Corporation. He said that although last year, owing to the rationing scheme, the output of gas had been somewhat less than in the previous year, the Company had been making a very considerably increased amount during the last three months compared with last year. The position had become so serious that £10,000 had been spent on the old disused Bourne Valley works to put them into a position to give a supply until such time as the main works at Poole

* See "JOURNAL," Vol. CXLVI., pp. 102, 150.

could be extended. The conveyor would be about 20 ft. high, and would run just above the houses of the road down which it ran.

Mr. Tyldesley Jones, referring to the proposal of the Corporation to extend to the west, said that a number of houses had already been pulled down in that district, and with the pulling down of further houses, an additional block of land would be available.

Witness said the site would be far too expensive; and, as it would be within a 300 yards radius of the High Street notices would have to be served on a very considerable number of people, and the opposition would be enormous.

Counsel then discussed the financial position of the Company and the advantages which they would obtain by the scheme. Witness pointed out that out of the total capital of half-a-million, £50,000 was sliding-scale. Under the slide a penny produced £5125, and of this £5000 went to the consumer and £125 to the shareholders. The remainder of the capital was fixed price capital.

Re-examined by Mr. Talbot, witness said that, in his opinion, there was no comparison between carrying the coal by means of a conveyor and by carts through the streets. But in any case, the Company would be liable for nuisance if they created one. The greatest amount of dust would be created at the loading and tipping ends, and there should be very little along the road. The question of extending to the west had been discussed with the Corporation; but no proposition of a really substantial extension beyond the pottery was suggested. The extension of the demand was going on very rapidly. In 1903, the sale of gas was 481,000,000 c.ft.; and if he had been asked at that time if the output by the year 1919 would have reached 1,200,000,000 c.ft., he would not have said so. He could see no useful purpose in preserving the restriction on the land to use it only for storage purposes.

In reply to the Chairman, witness said the Company asked the Committee for compulsory powers in regard to land for the conveyor, the construction of which would only mean the pulling down of a few houses.

Colonel *Morgan*, a Director of the Company and a member of the Council of the Institution of Civil Engineers, said he had carefully examined the scheme from the engineering point of view, and was convinced that it was the best in the circumstances. There were several conveyors in existence in various parts of the country, some of which crossed public roads, and they were working quite satisfactorily and causing no nuisance.

Mr. Tyldesley Jones, in cross-examination, put it that there was not such a conveyor running down a road with houses on either side, and the witness agreed that he did not know of such a case. The conveyor would run sufficiently high to clear the roofs of the houses.

Mr. *P. P. G. Moon*, Assistant Engineer to the Company, who had got out the engineering details of the scheme in the absence of the Chief Engineer (Lieut.-Col. Woodall) on active service, said that the existing Poole works were over-congested, as on peak loads it was working at its full capacity. The safe working capacity of the plant was 5½ million cubic feet per day; but the maximum output was now 6½ million cubic feet, so that they were working beyond the safe capacity. The new works were laid out for an additional capacity of 6 to 7 million cubic feet of coal gas, and about 3 million feet of water gas. This, however, was the theoretical capacity with all the retorts working. The total safe working capacity would be 7½ million cubic feet. The new site was 250 yards from the present one; and it was over this distance that the conveyor would work. With regard to the running of such cableways, he had worked beside one for three years in a chemical laboratory, and had not been inconvenienced. The noise was very much less than that of an electric tramcar; and so long as the buckets of the conveyor were not over-filled, there should be very little nuisance from dust. It had been suggested that lids could be placed on the buckets; but although there was no difficulty in that from an engineering point of view, he regarded it as undesirable, and even dangerous, to have lids flapping about when the buckets were titled for discharging the coal. The maximum tonnage of the ships which regularly brought coal to the Poole Quay was 1250 tons. This was the capacity of the Company's own steamer, the "Corbet Woodall," which had been sunk; but in building a new ship, it might be possible to go to 1500 tons.

[A number of photographs of cableways were shown to the Committee.]

In cross-examination, witness said it would be possible to arrange a measuring device so that the buckets were not over-filled. If, for instance, the buckets had a capacity of 3½ c.ft. and the measuring device only allowed 3 c.ft. to be loaded each time, there could be no danger of over-filling, and there would be little chance of dust falling from the buckets when they were in use. The cableway would be working night and day continuously. The capacity of the cableway would be 50 tons per hour, and thus it would take 25 hours to unload a 1500 ton boat. The estimated cost of the cableway was £10,000. He anticipated that the whole of the extensions proposed under the Bill would be required during the next ten years.

The Committee adjourned until yesterday.

BEDWELLTY URBAN DISTRICT COUNCIL BILL.

House of Commons Committee.—Thursday, July 3.

(*Before Captain* Starkey, Chairman, *Major* Oscar Guest, *Captain* Rankin, *and Mr.* Toothill.)

This Bill, promoted by the Urban District Council of Bedwellty, proposed to vary the terms of an agreement for the supply of gas to the Mynyddislwyn Urban District Council.

Counsel for the promoters was Mr. G. W. Bailey. The only opponent—the Mynyddislwyn Urban District Council—was represented by Mr. Clode, K.C., and Mr. F. N. Keen.

Mr. Bailey, for the promoters, said that under an Act passed in 1912 it was provided that if the Mynyddislwyn Urban District Council promoted a Bill authorizing them to supply gas within their own area, the Bedwellty Urban District Council should sell so much of their gas undertaking as was within the Mynyddislwyn Council's area; but that until such time as the latter Council had erected their own works, the Bedwellty Council should supply them with gas in bulk at the price of 3s per 1000 c.ft. The Mynyddislwyn Council in 1913 did promote a Bill; but they had not yet constructed their own gas-works. Meanwhile, the Bedwellty Council had been supplying gas in bulk in accordance with the terms of the 1912 Act. The Bedwellty Council possessed two gas-works—the Blackwood works and the New Tredegar works. The supply of gas to the Mynyddislwyn Council was delivered from the former works, at which coal gas was made; the New Tredegar works being used for the distribution of coke-oven gas, which was purchased. In 1915, terms were arranged by which the price was reduced from 3s. to 2s. 10d. per 1000 c.ft. The agreement was for a period of six years; so that it would expire in 1921. It had been found, however, that since then, owing to the continued rise in the price of labour and raw materials, the actual cost of making gas at the Blackwood works had risen to 4s. 2d. per 1000 c.ft.; and it was felt that it was inequitable that the Council should be compelled to continue to supply gas in bulk to the Mynyddislwyn Council at 2s. 10d. per 1000 c.ft., or that the terms of the Act of 1912 should now be enforced. When the reduction was made in 1915, the cost of manufacturing gas was not more than 2s. 10d.; and it was now asked that the agreement should be varied so that the price to be paid should not be less than the actual cost of manufacture. Clause 34 of the Bill therefore provided that:

> Notwithstanding anything contained in section 21 (Power to Mynyddislwyn Council to Purchase Part of Gas Undertakings) of the Act of 1912, and section 4 (Transfer of Northern Gas Undertaking) of the Act of 1913, or any agreement made under the provisions of the Act of 1912:
>
> (*a*) The price to be paid by the Mynyddislwyn Council to the Council shall be the net works cost of the gas supplied from the Blackwood works of the Council, together with such a proportion of the interest on capital charges as is properly applicable to those works.
>
> (*b*) Either the Council or the Mynyddislwyn Council may, on giving six months' notice in writing to the other, determine the obligation on the part of the Council to give a supply, and on the part of the Mynyddislwyn Council to take a supply, of gas under the provisions of the aforesaid Acts.
>
> (*c*) Failing agreement as to the price to be paid by the Mynyddislwyn Council, the same shall be determined by arbitration in accordance with the provisions of section 21 of the Act of 1912.

To this proposal the Mynyddislwyn Council objected, and petitioned against the Bill.

Mr. *F. H. Canning*, the Engineer and Manager of the Bedwellty Council's gas undertaking, gave evidence in support of Counsel's statement as to the increased cost of gas since 1915.

Mr. Clode, for the Mynyddislwyn Council, in the course of his cross-examination, pointed out that gas was being purchased at the New Tredegar works by the Bedwellty Council for 1s. 6d. per 1000 c.ft. If this was added to the cost of manufacturing gas at the Blackwood works, the net cost to the Council would be less than that proposed in the clause in the Bill which specifically named the Blackwood works.

Witness explained that the two works were quite distinct, as there was a mountain between them. On account of this peculiar circumstance, the Bedwellty Council really had two gas undertakings.

The Chairman said the Committee were aware of the altered conditions arising through the war, and felt that there was justification for adjusting the charge provided for in the Act of 1912.

After the lunch interval, there having been some discussion between the parties,

Mr. Bailey suggested that it would probably meet the case if he added to subsection (*b*) of section 34 of the Bill, as drafted, words to the effect that, at any time after the expiration of five years from the passing of the Act, either the Council or the Mynyddislwyn Council could give six months' notice to determine the agreement. This would give the latter ample time in which to settle what they would do as a matter of policy.

Mr. Clode said that if such a clause was put into the Bill, he must have a longer notice than six months.

The Chairman pointed out that Mr. Clode's clients would have five years to start with.

Mr. Clode agreed, but said he would not know during that time what the Bedwellty Council would do at the end of that period; and it would be impossible to put up gas-works in six months. So far as this point was concerned, he would be met if sub-section 4 of section 21 of the Act of 1912 was altered so that he not only had the option of putting up works for the manufacture of gas, but also, as an alternative, means for obtaining a supply of gas. This would enable his Council to take advantage of the enormous quantities of cheap coke-oven gas which was available in the district without the necessity for putting up gas-making plant, which in a small district like this would be uneconomical. He also objected to being fixed to the costs at the Blackwood works, because by doing so the Committee would be tying his Council for all time to these works.

Mr. Bailey said he would agree to the suggested alteration of sub-section 4 of section 21 of the Act of 1912, subject to the clause in the present Bill as to price standing.

Mr. Clode said the opposition was now really reduced to this: Was it fair to tie him down to the cost price at the Blackwood works? He contended that it would be fair to take the average cost to the Bedwellty Council of the gas at their two works, treating them as one undertaking, as they were, and giving him the benefit of the average price—*i.e.*, 4s. 2d. and 1s. 6d. added together; the latter being the price at which the Bedwellty Council purchased coke-oven gas at their New Tredegar works. He was quite willing to pay this average price. This price, of course, would require adjustment from time to time, because, under clause 25 of the present Bill, the Bedwellty Council contemplated taking a further supply of coke-oven gas. They might take coke-oven gas at the Blackwood works and scrap the manufacturing plant; and then his Council should have the benefit of that.

Therefore, he asked the Committee to treat the two works as one undertaking, and give him the advantage of the average cost to the Council.

The CHAIRMAN asked if the Bedwellty Council made any differentiation in the price charged for coke-oven gas and coal gas.

Mr. CLODE said the consumer was charged the same price; so that, for this purpose, the Bedwellty Council treated their two works as one undertaking.

Mr. BAILEY reminded the Committee that the purchase price of 1s. 6d. per 1000 c.ft. for the coke-oven gas did not constitute the total cost to the Council, because there were the distribution costs. If they took coke-oven gas at the Blackwood works, the Mynyddislwyn Council would get the benefit of this in paying the cost price at this works as suggested in the Bill. He did not object to the price being the average of the two supplies so far as the Blackwood works were concerned when coke-oven gas was dealt with there also. The two works would always constitute two undertakings, because of the mountain in between. The mains of the two works were nearly six miles apart at the nearest point.

Mr. CLODE said the Gas Light and Coke Company had several works, and they averaged the cost over all of them, and based their charge upon that. Incidentally he mentioned that the leakage was 36 p.ct. in Bedwellty.

The CHAIRMAN said the Committee were of the opinion that the two works should be treated as one undertaking.

Mr. BAILEY said he hoped that was not a decision, because he had further evidence to put before the Committee. He only put forward his suggestion on the basis of the Blackwood cost being accepted.

The CHAIRMAN said he did not wish to shut out any evidence. But that was the Committee's view, and he did not know that any evidence would alter it.

Mr. BAILEY (after consulting his clients) said that, provided in the expression "cost of gas" it was made clear that due allowance would be made for leakage and the capital charges on all plant, he was instructed to say there would be no objection to what was proposed by Mr. Clode.

Mr. CLODE replied that these questions would be determined by the arbitrator, if they could not agree.

The CHAIRMAN, in repeating his decision that the two works must be treated as one undertaking and the cost of gas based upon that, said it must be left to the arbitrator to determine what should be included in the expression "cost of gas."

Mr. BAILEY then submitted the following clause to give effect to the Committee's decision:

> The price to be paid by the Mynyddislwyn Council shall be the net cost of the gas supplied by the Council, together with such a proportion of the interest on capital charges as is properly applicable to the gas undertaking.

Mr. KEEN (for the Mynyddislwyn Council) said this raised an entirely different point. It brought in the capital charges on the whole undertaking. He suggested the following clause:

> The price to be paid by the Mynyddislwyn Council to the Council shall, as from Sept. 30, 1919, be the average cost to the Council of all gas made by, or bought by, them, which price, failing agreement, shall be determined by arbitration under the provisions of section 21 of the Act of 1912.

The amount of capital charges which would come in would be determined by the arbitrator. His clients had their own distributing system; and clearly the capital cost of the distributing system in Bedwellty should not be a charge to be taken into account when computing the cost price to his clients. This, however, was a matter which must be left to the arbitrator.

The CHAIRMAN said the Committee would accept the clause put forward by Mr. Keen, as they considered it covered the case.

Clauses were then adjusted, and the Bill was ordered to be reported for third reading.

Galashiels Gas Company.—The Galashiels Gas Light Company's annual statement shows profits of £2757. A dividend of 5 p.ct. is declared, and the sum of £657 is placed to the reserve fund, which now amounts to £1835. The charge for gas is 4s. 6d. per 1000 c.ft., a reduction of 2d.; and the discount allowed to power and trade consumers is increased from 5 to 10 p.ct. The estimate of Messrs. R. Dempster & Sons, for a complete installation of vertical retorts (£25,250), is accepted.

New Mills Gas Prices.—The New Mills District Council have decided to increase the price of gas from 3s. 10d. to 4s. 6d. per 1000 c.ft. supplied in New Mills, and to 5s. 3d. for Disley. Mr. Yates (the Chairman of the Gas Committee) said there would be a deficiency of £1600 on the year's working unless the prices were advanced, owing to the increased expenses for which Government control was responsible. As the maximum price of gas allowed by the Council's Act of Parliament has now been reached, it was resolved to make application for powers to further advance the prices if necessary.

Primitiva Gas Company's Position.—The City Notes of "The Times" last Thursday contained the following: On several occasions recently we have drawn attention to the misfortunes of the Primitiva Gas Company. The Company has been prevented from raising the pre-war price of gas, and the Municipality owes a large amount to the Company for gas. Last December, it will be remembered, a decree was passed by the Municipality practically cancelling the Company's concession. Recently, however, a Municipal Gas Committee was appointed to go into the whole matter, and negotiations were opened. It is now understood that the recommendations of this Committee are in favour of the Company. These recommendations, however, have to be reported back to the Municipality; but in view of the fact that the Committee was appointed by the Municipality itself, there appears to by some ground for hoping that a settlement of the Company's long-standing grievances is in sight.

MISCELLANEOUS NEWS.

THE GOVERNMENT AND THE GAS INDUSTRY.

Deputation to the President of the Board of Trade.

On Friday last, Sir Auckland Geddes, the President of the Board of Trade, received a deputation from the National Gas Council which placed before him the whole position with regard to the gas industry, and asked for Government assistance to put it on a sound economic and financial basis in the altered conditions brought about by the war.

The President of the Board of Trade was accompanied by Mr. Honey, Sir William Marwood, Mr. Garnham Roper, and Mr. Carlhill of the Department. The Deputation, which was led by Mr. Milne Watson (the Governor of the Gas Light and Coke Company and President of the National Gas Council), consisted of Sir Dugald Clerk, F.R.S. (President of the Institution of Gas Engineers), Sir Arthur Duckham, Mr. W. J. Smith, Mr. E. J. Fottrell, Mr. A. S. Legat (Coatbridge), Baillie Drummond (Glasgow), Mr. R. Halkett (Sheffield), Mr. R. G. Shadbolt (Grantham), Mr. Charles Hunt (South Suburban Gas Company), Mr. R. Bruce Anderson, Mr. Samuel Tagg (Preston), Mr. F. W. Goodenough (Gas Light and Coke Company), Dr. Carpenter (South Metropolitan Gas Company), Mr. F. H. Jones (London), Mr. J. H. Ellis (Plymouth), Mr. S. H. Jones (Commercial Gas Company), Mr. T. Goulden (Gas Light and Coke Company), Mr. J. Mogford (Briton Ferry), Mr. A. F. Phillips, Mr. W. N. Westlake (Exeter), Mr. A. W. Branson (West Hartlepool), Mr. T. Hardie (Newcastle-on-Tyne), Mr. H. Wade Deacon (Liverpool), Mr. R. W. Edwards (Aldershot), Mr. W. J. Grey, Mr. W. E. Price (Hampton Court), Mr. D. H. Helps (Reading), Mr. W. W. Townsend (Colchester), Mr. A. A. Johnston (Brentford), and Mr. G. Evetts.

Mr. D. Milne Watson's Speech.

Mr. D. MILNE WATSON, introducing the deputation, said: Sir, before making any remarks I wish to thank you, on behalf of the National Gas Council, for arranging to receive this deputation from the industry to lay before you the facts with regard to its position. I have been asked specially by the National Gas Council to speak first on the deputation, and to be followed by Sir Dugald Clerk and Sir Arthur Duckham. The gas industry is a most important industry. As you will gather some 150 millions of capital is invested in it; and it employs, approximately, 100,000 workers. Like all industries during the war, we have experienced very trying times; but, as I hope to show you, the position of the gas industry is altogether an exceptional one, owing to the legislative control under which it works. The industry is carried on by some 1600 different undertakings; and the capital, which I mentioned as being 150 millions, is divided between sliding-scale companies, maximum-dividend companies, undertakings owned by public authorities, and some 800 smaller non-statutory undertakings, mostly in villages. Apart from the money invested in the industry, it uses 20 million tons of coal a year. It is the largest consumer in the country with the exception of the steel trade, consuming even more than the railway companies, who use 15 million tons. It uses some fifty million gallons of gas oil. From this and from coal, 250,000,000,000 c.ft. of gas are produced, and 13,000,000 tons of coke. To show how universally gas is used, there are some 4,000,000 users of it through ordinary meters and 4,000,000 by automatic meters—in other words, practically every household in the country, except in isolated farmhouses and out-of-the-way villages, is supplied with gas. As showing how gas enters into the trade of the country, I may say that there are 300 methods of applying gas in industrial processes, and nearly 3000 trades in which gas is used in various ways—in fact, almost everything that one touches in some way or other has been to a certain extent manufactured by gas or a bye-product. Ten million tons of coke are available for sale to the public as an excellent fuel.

During the war, the industry rendered the nation very great assistance in the production of bye-products necessary for the country in the form of benzol and toluol for the manufacture of high explosives, dyes and motor spirit, sulphate of ammonia (one of the best fertilizers), creosote (largely used as a fuel by the Navy), in addition to many other products, such as tar for making roads and carbolic for disinfectants. To give some idea of the magnitude of its operations, one company alone supplied enough "T.N.T." materials for the manufacture of lyddite and other explosives to fill 160 million 18-pound shells, 17 million gallons of oil, and 13,000 tons of disinfectants. In order to obtain the total for the industry, these figures could be multiplied by at least five or six. The importance of the industry cannot be over-estimated. Lord Moulton (Director of Explosives Supply)—who was to have been here, but has been unavoidably prevented—stated that, had it not been for the gas industry, the country would not have been able to carry on the war during its earliest period. In other words, the war would have been lost had it not been for the gas industry and the fact that we had, of course, so many gas-works in this country.

GAS INDUSTRY ESSENTIAL TO THE COUNTRY.

The prosperity of this great industry, which it is admitted practically saved the country in the time of war—an industry which, if it were crushed out of existence to-morrow would have to be immediately reinstated by the Government if the country is to hold its own either in war or peace—is being threatened most seriously. If we are going to hold our position among the competitive nations, the bye-products which I have just mentioned will be as essential in time of peace as they have been in the time of war, which has fortunately passed. For example, everyone knows the story of how Germany built up its great dye industry by working up the bye-products which were largely obtained from this country; the dyes from such bye-products being purchased by the rest of the world from Germany to the extent of about £10,000,000 per annum. If this country's dye industry and chemical trades are to be kept in existence, it is necessary for the gas-works to carbonize coal. The menace to the gas industry comes from two directions. The first is, unfortunately, from the idea that has been spread

about—and I regret largely spread about by Government Committees—that electricity is for one and all purposes the future saviour of the country, and will effect a great saving in coal consumption, and, inferentially, that gas is of very little importance. It is not my intention to make any attack upon the sister industry, electricity. We admit quite freely that electricity is an absolute necessity in the country, and it is desirable that the present electricity supply should be improved. But what we do strongly object to, and what we do appeal to the Government to realize before it is too late, is that while electricity is useful for many purposes, it is not useful for all, and that gas in certain directions is much better. Therefore there is no reason why the cold shoulder should be given to gas, as it has been given recently by a number of Government Committees. It is fully admitted by both parties and by everyone that it is a wasteful thing to consume raw coal for all purposes, and that the aim should be to get coal carbonized. The home production of coal in Great Britain in 1913 was (say) 190 million tons, of which only about 10 p.ct. was carbonized by gas undertakings; 20 p.ct. being used for domestic purposes, with the entire loss of the bye-products. During the same year, Germany carbonized 33 p.ct. of its home-produced coal, and only used 10 p.ct. of the raw coal for domestic purposes. The small proportion used for domestic purposes is the more remarkable because the population of Germany was about 40 p.ct. greater than that of the United Kingdom, and its estimated coal reserves more than twice as great. It is agreed on all hands that it is most necessary that the consumption of raw coal, whether in domestic grates or under boilers, in this country should be cut down to the lowest degree in order to obtain the valuable bye-products which are contained in the coal, on which alone the chemical industries of this country can be established and maintained. As I have already said, electricity has its great uses; but when it is claimed that electricity is suitable for all purposes, and the Government are asked to back electricity schemes as a means for conserving coal, a great mistake is being made. Electricity in particular is far behind gas in the matter of heating, as in that field it is extremely wasteful. In the process of the conversion of coal into gas, 70 p.ct. of the heat is saved for the community, and is delivered in the shape of gas or coke, whereas when turned into electricity at the best only 12 p.ct. of the heat reaches the consumer, and at the same time the bye-products are entirely destroyed; so that you see, without going very deeply into the figures, the enormous difference there is. I do not propose to go into any great detail with regard to this, because I shall be followed by Sir Dugald Clerk, who has made a close investigation into the whole matter, and will be prepared to give you the result of his investigation, which will go to prove that undoubtedly if the nation wishes to conserve its coal supplies in the future, it will see that its coal is carbonized by the gas undertakings, and not wasted by being burned in domestic grates or under boilers.

Gas *v.* Electricity in Coal Conservation.

If gas were to be superseded by electricity the result would be a very great loss of coal to the country. At the present moment, according to the latest estimates of the gas used, 10 p.ct. is employed for power, 20 to 35 p.ct. for lighting, and 55 to 70 p.ct. for heating, depending to a certain extent on the part of the country in which the gas is consumed. Heating is the largest use of gas—going up, as I say, to from 55 to 70 p.ct. If electricity were to take up this instead of gas, with the figures I have given the waste would be enormous, and would run into the loss of millions of tons of coal per annum. In this connection, I should like to refer to the housing schemes of the Government, as in some of the reports by the various Committees preference is given, or eulogistic reference made, to electricity; and the prominence given to electricity in the Government's reconstruction programme has given many people the impression that it would be to the advantage of the nation if electricity were adopted for all purposes in every home. Such a policy, if followed by housing authorities, would not only be very prejudicial to the gas industry, but, as the facts I have stated make evident, would lead to great waste of the nation's coal, inasmuch as the desired cooking and heating could be effected better by gas than by electricity with the consumption of a far smaller quantity of coal, while for lighting the working man's wife greatly prefers gas both for its economy and for the certain amount of warmth it gives during the dark days. As, moreover, under the most favourable conditions the cost to the householder of electricity as a fuel would be substantially greater than that of gas for equal service, there can be no doubt that the great majority of working-class households would soon discard electrical apparatus in favour of gas if the former were installed; and a very large sum of money expended on such apparatus would be wasted. For the saving of labour and dirt in the home and the prevention of smoke in the air, as well as to secure the best value out of the coal, gas ought to receive the fullest support by the Government in connection with the housing schemes now under consideration. As I have said before, I have no desire to attack electricity. We believe there is plenty of room for both. We believe the electrical industry is a necessity to the country; but we ask the Government to recognize that if they press electricity for all purposes on housing authorities, including that of fuel, and destroy the gas industry, they will be striking a blow not only at the industry but at the prosperity of the country, and will bring about a serious depletion of our admittedly all too small coal reserves. The war has taught us many lessons; and this is one of the most important—that coal is the lifeblood of this country.

Sliding-Scale and Present Day Conditions.

The other danger to the industry is its financial position. As I explained, there are some 1600 gas undertakings in the country divided into sliding-scale companies, maximum-price companies, and municipal authorities. I may be allowed to explain what this means, because it is rather essential that you should understand it. [Mr. Milne Watson then explained the working of the sliding-scale and the operation of a maximum dividend and maximum price.] The standard and maximum prices and rates of dividend now in force were fixed by Parliament at a time when conditions and costs of working were normal, and conformed to the varying circumstances connected with each undertaking. It is generally agreed that before the war they formed the basis of an equitable arrangement between the producer and the consumer and encouraged skill and economy in management; and we have no desire in the gas industry to get rid of the principles underlying the sliding-scale. The war has, however, destroyed the various bases upon which this relationship was established. The war has altered the whole conditions of our working; and it is obvious to everyone that a sliding-scale based on pre-war conditions is quite unsuitable to-day. All gas companies' costs have risen enormously through causes entirely beyond their control. Special mention, for example, might be made of the famous 2s. 6d. which was put on coal, virtually as a tax, and the extra 2s. 6d. put on Welsh coal. Coal has, in fact, increased by 80 p.ct. since the war, and a further rise is threatened; gas oil, which is one of our raw materials, has gone up no less than 250 p.ct., and has been a great deal higher; and freights have advanced no less than 300 p.ct. In the old days, we brought our coal to London at something like 2s. 9d.—the shipper paying the discharge; whereas the price fixed by the Shipping Controller, which is the maximum, but it is also the minimum, is 12s. 9d. per ton, the buyer of the coal paying for the discharge. So that there is an enormous advance. General repairs have advanced by 150 p.ct.; labour, by 100 p.ct. and upwards under Government awards and agreements, and although it is true that bye-products have yielded more in price than they did before, they have not yielded anything like as great a percentage of the cost of the coal. Before the war it was customary to obtain from 80 to 85 p.ct. of the cost of the coal by the sale of bye-products; while now from 60 to 65 p.ct. is all that is obtained. So that we are not able to overtake the advance in the price of coal by the enhanced price received for the bye-products.

Financial Hardships.

I should now like a word to explain the difference between the gas industry and almost every other industry. Another industry, when it finds its expenditure rising, puts up its prices and maintains its dividends. I am not accusing anyone of profiteering, but it is done simply in order to get the same dividend. Owing to our sliding-scales and maximum prices, however, any rise in the price of gas brings about a fall in the dividend, by which it will be seen there can be no charge of profiteering in the gas industry; for it is simply the case that as the price has gone up, the dividend has steadily fallen off. Another difference is that any ordinary manufacturer is able to close-down his business, whereas the gas industry, under Statute, is compelled to go on supplying gas, whether at a profit or a loss. Everyone, in fact, within a certain range is entitled to a supply of gas in as large a quantity as he likes. In view of the increased costs, the price of gas has had to be advanced enormously; and, in consequence, the dividend has fallen most seriously. The industry bore this for a time without complaining, feeling that it had to take its share like every other industry in the difficulties and troubles arising during the war. The war has, however, finished, I am glad to say; but it has left its indelible mark on prices of all raw materials. It is requisite, therefore, to consider the future; and if the industry is to be carried on successfully, it is absolutely necessary that it should be carried on on a sound financial basis. The industry gratefully admits that something was done by the passing of the Temporary Increase of Charges Act of last year, when a certain amount of financial relief was given to the industry by being allowed to pay three-quarters of our standard or pre-war dividend, whichever was the lower. This measure has had this effect, at any rate—it has prevented in some cases the dividend from entirely disappearing. It is something, but it is not a great deal. Sir Albert Stanley, your predecessor, said on the floor of the House that the time would come when the whole financial position of the gas industry would have to be looked into. I daresay you are familiar with that; but we were very thankful to get it from him, and we hope you are going to carry out his policy. The relief that has been given us has done nothing towards re-establishing the industry on a sound financial basis. Even under the Act a great many companies are only able to distribute 3 p.ct., and in some cases it may possibly be even less. At a time when the State is offering 5 p.ct. for money, how can the gas industry expect to live, being able only to pay a dividend of 3 p.ct. or less? In consequence of the reduced dividends necessitated by the conditions referred to, an enormous depreciation has taken place in the capital value of gas stock; making it an extremely difficult matter to raise further capital to enable the gas industry to carry out long delayed extensions and to effect improvements which experience during the war has indicated. Capital raised upon unfavourable terms is going to be a permanent hindrance to the production of cheap gas, inasmuch as the less advantageous the terms upon which new capital will be raised the greater the amount which must be permanently included in the price of gas for capital charges. If you desire it, I can give you a comparison of the Stock Exchange quotations of some of the largest undertakings, revealing a depreciation from June, 1914, to June, 1919, of 30 to 40 p.ct. The depreciation would amount, for the whole industry, to something like £50,000,000.

Sir George Beilby, presiding over the Fuel Research Board, has made certain recommendations with regard to future gas standards, recommending elasticity in regard to the calorific power of the gas to be supplied. The gas industry does not ask for freedom to do exactly what it likes, or for the entire removal of control; but it asks that power shall be given to enable it to do the best it can to supply at the lowest possible price the gas most suitable for the public, with a reasonable return on the capital invested, having regard to the altered value of money—such a return as will do justice to the existing shareholders and secure the support of the investors in the future. It desires to see the trammels under which it has been working removed, so that it can develop itself naturally. In this way it welcomes the proposals made by Sir George Beilby's Committee; and it is to be hoped that the Government will see their way to give effect to those recommendations of the Fuel Research Board which recommend the necessary elasticity with regard to the quality of gas to be supplied in the future.

With reference to the financial aspect of the case, the industry does not ask for any State assistance—we would not have disclosed the emptiness of the cupboard except convinced of the justice of the case and the belief that relief will be given—but it does ask for fair treatment, for revision of the present sliding-scale and maximum prices, and

for relief from the incidence of the financial regulations at present in existence which belong to another time and another order of things. The gas industry, as I have said, does not ask for State assistance in regard to the raising of money, because if Parliament will allow the provisions relating to the sliding-scale and the maximum price to be revised, and will take into account the new basis of the cost of raw materials, labour, and the value of money, the industry will be able to find the capital it requires without further assistance. The public will, when they see that justice has been done, be prepared to put their money into the industry once more. At the present moment, the industry is so hard hit—so exceptionally and unjustly handicapped—that in some cases undertakings have exhausted their borrowing powers and cannot carry on much longer. Though there is no likelihood at the present time of any reduction in the cost of raw materials—the trend is still the other way—the industry does not want to ask for anything which might possibly be unfair to the consumer of gas in the future. We would, therefore, suggest that there should be a clause inserted in any Act that may be passed dealing with the subject to give powers of revision, and in that way safeguard both the consumer and the gas undertakings.

One other point that we wish to urge is that the Board of Trade should be given extended powers to issue Provisional Orders dealing with gas questions generally, including amalgamations, quality of gas, sliding-scale, and maximum and standard prices, &c.

I am afraid that I have taken up more of your time than I ought; but the subject is an important one. In conclusion, I should like to say that the deputation represents municipalities as well as companies, both sliding-scale and maximum price, who are united in asking the Board of Trade to lose no time in assisting this important industry once more to take its proper place among the other great public utility services.

Sir Dugald Clerk's Speech.

Sir DUGALD CLERK, F.R.S., President of the Institution of Gas Engineers and Vice-President of the National Gas Council, who followed, said: A great many statements have been made, as Mr. Milne Watson has said, in various Government Committee reports as to the high efficiency of electricity as a fuel saver in the conservation of fuel. I think we are all agreed as to the importance of fuel conservation; and accordingly I have studied this matter. I do not know whether you have seen the report of a lecture I gave at the Royal Society of Arts, but the whole of the detail work is shown in this report; and I will merely outline the broad general facts.

GAS AND HEAT EFFICIENCY.

As Mr. Milne Watson has said, the gas industry, from the thermal point of view—the heat economy point of view—starts very high up. In the examination I made, for practically the whole of the coal used in the country for gas production the average thermal efficiency of the carbonization process was 71 p.ct. for all the country. It was not merely for one gas-works, but for all works. If you put a hundred heat units into the retorts, and you deduct all the heat required for working the retorts, &c., you get out in the form of gas, coke, and tar, and other numerous products, 71 p.ct. of the heat that existed in the original fuel. That was an average value for the whole of the country; but many single works were doing very much better than this—they were getting as high as 82 p.ct. carbonization efficiency. Carbonization alone does not tell the whole story. If you deal with coal gas and assume that the coal gas produced has to bear all the burden of the heat losses, and no heat losses are debited to coke or tar or the other products, such as sulphate of ammonia, &c., you will find that the average thermal efficiency of the gas production of Great Britain is 46 p.ct. This value, however, although very high, is capable of being made still higher. In what is commonly called straight coal gas—*i.e.*, gas produced only by the distillation of coal without any addition of water gas or anything of that kind—you get as a maximum, roughly, about 25 p.ct. of the whole heat of the coal carbonized in the form of gas. It is quite obvious that if that 25 p.ct. is to bear the whole of the heat losses, and you could arrange a highly efficient process to convert coke into gas and add that gas to the gas coming from the straight distillation of coal, so that instead of obtaining only 25 p.ct. of the whole of the heat in the coal you could obtain generally speaking 50 p.ct. of the whole heat in the coal, then your efficiency rises very materially. And you can do it. Many works do it by the addition of 35, 36, or 40 p.ct. of water gas; and it is quite a practical proposition to raise it to 50 p.ct. In that case, the thermal efficiency of gas production is increased to 70 p.ct., assuming all the best methods are used for conserving the heat. There are many methods of obtaining economy which can be made still more economical; but by this arrangement you could make the present amount of gas with a very great reduction in the total fuel consumption. That is speaking of the future. So far as the present is concerned, 46 p.ct. is the figure I have obtained in my report. Comparing this with electricity, the average for the country, as shown by the Coal Controller's report, is 8·5 p.ct. for electric generation for the whole kingdom—*i.e.*, you put in a hundred heat units into the boiler, but you only get 8½ p.ct. of the total heat; the other heat goes in the boiler and in the thermodynamic losses. A great many people do not understand that. We see the efficiency of a boiler marked down at 85 p.ct., which means that the total steam discharged by the boiler into the engine is the equivalent of 85 p.ct. of the coal. I agree. But though the boilers do that, when it comes to the engine, the efficiency of transformation of the power in the heat engine is relatively small. In the case of the most economical steam turbines—it is, of course, higher than in the smaller turbines—the general effect is that, allowing for boiler losses and thermodynamic transformation, you put 100 units into the boiler furnace and get out 8½; and when you distribute that, it comes down to 7½. If you compare these values, you will find that, so far as producing heat is concerned, gas is 5⅓ times more efficient than the ordinary average electric distribution.

Sir AUCKLAND GEDDES: That is, heat and power?

Sir DUGALD CLERK: Not power, but for heat generation. That assumes that if the instruments we are using—electric radiators, heaters, &c., on the one hand, and the gas apparatus on the other, are of the same efficiency in use—you have in the case of gas, so far as heat is concerned, over five times as much. I have gone into this question, so as to compare the relative efficiencies of electricity and gas using appliances for heat; and I found that, if you take the average in use, you can say that, for heating purposes, electricity would consume four times the amount of fuel for a given production of heat as compared with gas. That is, allowing for all the losses in the different apparatus and the fact that some of the electric apparatus has a higher efficiency in use, you still have four times the efficiency in heat in the case of gas. If you examine the question of lighting by electricity, using the 1-watt lamp, and lighting by gas, using the ordinary inverted incandescent mantle, I have made many tests on this subject and I find electricity has a slight advantage in thermal units. The calculation was that electricity used only 84 p.ct. of the heat units used in gas. The reason is that light is a curious phenomenon, and the amount of energy involved in the production of light is extremely small. The production of light depends not upon the total energy in the incandescent body, but upon its temperature. The evolution of light roughly proceeds as the fourth power of the temperature of the metal of the filament or the mantle; and if you get the filament very hot, as you can in the half-watt lamp, you can get a high light generation with small energy. So that, in making these comparisons, that is why I distinguish between light and heat. In light, the comparison comes out slightly in favour of electricity; but I should say that it depends upon what instrument is used. If you have high-pressure gas lighting, you get about two or three times the amount of light for a given amount of total heat that you do in the ordinary low-pressure lighting, and you get in the half-watt lamp about twice the light that you do in the ordinary 1-watt lamp. But, of course, the half-watt lamp is only used for certain special circumstances. If it is to be employed as a small lamp, it will have to be carefully shaded to prevent injurious effect on the eyes, owing to its high temperature. But taking one thing with another, one could not say, on the question of light, that gas is better than electricity—I am now speaking of fuel from the thermal point of view, and not from the money point of view. Mr. Milne Watson dealt with the financial point of view. As a matter of fact, gas is cheaper all round than electricity from the money point of view, but not from the thermal point of view. It cannot be said that light so generated is to any really dominating extent better either by gas or electricity—it depends on the future struggle between these two methods of lighting what efficiency figures you will get. I can see certain methods with electricity of increasing the efficiency, and many methods for increasing the efficiency of gas. That is a matter that is in the balance, and in a year or two it might be more favourable for electricity or more favourable for gas.

The third thing to consider is motive power. But in calculating motive power one has to consider the relative efficiency of the steam-engine and the gas-engine. When I first began to work on gas-engines, forty years ago, the highest thermal efficiency we had in a steam-engine did not exceed about 8 p.ct. By the use of very high superheats and long expansions and high vacua, it is now possible, with the large turbines, to get 18 p.ct. This is the very best the steam-turbine has yet done, and it cannot go very much further. It might be made up to 20 p.ct., but it could not go beyond that. Taking the total heat converted into mechanical work, the internal combustion engine is so far the most economical engine that has yet been invented or discovered. In a good internal combustion engine of the ordinary explosion type, with 14 or 15 inch cylinders, one can get a thermal efficiency indicated of 35 p.ct., and a brake efficiency of 30 p.ct.—*i.e.*, you get about one-third of the whole of the heat of the fuel in motive power. The best you can do with steam is to get 18 p.ct. So that we have a long lead on economy in the internal combustion engine. In the Diesel type, using the steam combination that has been considered for a long time, the efficiency goes even higher—the thermal efficiency goes up to 40 p.ct.

Sir AUCKLAND GEDDES: Have you got comparable figures for electricity?

Sir DUGALD CLERK: The steam-figures are basic figures for electricity.

Sir AUCKLAND GEDDES: Yes; but what are the final figures in the motor?

Sir DUGALD CLERK: If you take the final figures in the electric motor, it stands in this way: At present, the generating efficiency is 8½ p.ct., and at the motor you get about 7·6 p.ct.—it reduces the actual power given out by the motor to rather under 7 p.ct. of the total heat in the original fuel. That is the present state with electricity. The highest of the present generating station figures given to me by the Coal Controller show an efficiency of 13 p.ct., and you get 11½ p.ct. at the motor. It is not, however, the thermal efficiency that is the strong point. Where the Government reports have been making a mistake is in assuming that the strong point is the thermal efficiency. It is not. You always have a relatively wasteful power-generated electrically. If you have a first-class steam installation in the same place, you can always get a better efficiency than the electrical efficiency. The electrical efficiency depends in the first instance on the efficiency of the steam-engine, whether it is a turbine or simple steam-engine, in the generating station. The highest case is 13 p.ct. at the present time, and the highest hoped for is 18 to 19 p.ct. in the new generating stations that are spoken so much of—the very large stations with high vacua. In making my investigation I came to the conclusion that the safe figures to take were that 65 p.ct. would be heat, 25 p.ct. light, and 10 p.ct. motive power. Mr. Milne Watson has got later figures, which are 70 p.ct. heat, 20 p.ct. light, and 10 p.ct. power. But if you take the case of 65 p.ct. heat, 25 p.ct. light, and 10 p.ct. power, and assume you put up electricity stations all over the country which are no more efficient than the present average, in that case you will require to use 2·7 times the fuel that you use for gas to produce the same service. But if you take the 70, 20, and 10 figures of Mr. Milne Watson, you would require to use three times the fuel to produce the same service. I have gone into the question of the high efficiency electrical service with the higher engine efficiency of 18 p.ct., and you naturally have a much larger proportion to distribute. If Mr. Milne Watson's figures be the reasonable arrangement for a gas scheme, if we are allowed certain freedom as to calorific power, I still find that, with the best electricity against the best gas, you would require double

the fuel consumption for the electricity scheme. This means that, so far as economy in fuel is concerned, because of the large proportion of heat that is used in the country, electricity is not suitable. It is not suitable for effecting economies all round. There are many instances in which you must have electricity, such as for very high temperature work, electrolytic deposition, and the driving of tramcars and trains, and so on. We are using internal combustion engines in all our works; but our distribution system within the works is electric. The best distribution system that you can have cannot give you the efficiency that you get in individual works where gas-engines are used. I should be very sorry indeed to find anything done to prevent the competition of the different forms of motive power with each other. There is no doubt at all that if you take a gas-engine or an oil-engine installation of the very latest type, especially with this method of steam recuperation with which you get as high as 40 or 45 p.ct. of the total heat of your fuel, you have a very much more economical electric generating station inside your works with small engines on the spot than you could possibly have with any great system of distribution.

Sir Arthur Duckham's Speech.

Sir Arthur Duckham said that he had ceased to be a Government servant within the past few days, and had only just returned to the fold of the gas industry. He had not had a chance to prepare anything to speak about; but he would try and give a bird's eye view of the industry as he saw it, having been away from it for some time. The gas industry undoubtedly—and his experience at the Ministry of Munitions proved it—had done more for the country than any other industry in the matter of material it had provided for the war. It had met the requirements of the country at various times, and he need not relate the many things that had come from gas-works. The industry had undoubtedly been hit harder than any other general industry that he had come across while in the Ministry. One point not mentioned by Mr. Milne Watson and Sir Dugald Clerk was the question of the distribution of coal. The Coal Controller had undoubtedly distributed the quantity of coal available in the best way considering the facts of the case; but it had not been realized what a difference there had been in the quality of coal. Coal from one pit might be delivered to a works, and the next coal would be of an entirely different type. All carbonizing plants were more or less scientific plants. There was a certain science of carbonization, and all carbonizing plants wanted special treatment by the workmen. It took a long time to train the men to work carbonizing plants, and there had been a considerable loss in efficiency through the varying qualities of coal that were delivered to the same works. As the coal position improved, so this matter would be put right; but it had been a great disadvantage to the gas industry during the war. A second great disadvantage was the question of not being able to pay a reasonable dividend on capital. Mr. Milne Watson had dealt with this fully; but it was absolutely stopping progress in the gas industry. Nobody would put money into the industry on a 3 p.ct. basis. Then there was the question of how all the plant and materials required for gas undertakings had increased in cost by 200 to 250 p.ct. But he need not dwell on this. Undoubtedly conservation of fuel was necessary; but practically all conservation of fuel came from carbonization. The Williamson Committee laid it down that this must be done in discussing the general question of erecting electric power stations; and the future of coal conservation in this country lay with gas engineers to a large extent. In his opinion, the manufacture of electricity must begin through the gas industry. He would also like to say something of what the gas industry had done in the matter of fuel oils for the Navy during the war. In a time of great stress, the gas industry came forward, with the coke-oven industry; and the fuel oil supply provided for the Navy was of very great value. In his opinion, it was a disgrace to the country that, with our great possibilities for obtaining fuel oil at home, we should be sending our money out of the country to buy these products. A most important point was that the gas industry should be treated so that it could raise money at a fair rate, and another was that it should be allowed to manufacture its products on the most economical lines, both for manufacture and consumption. The consumer was safeguarded because of the very strong competitor gas had in electricity; and he could assure the President of the Board of Trade, from his knowledge of the industry, that its sole purpose was to serve the consumer. He was quite certain that if the Board of Trade would consider gas undertakings on the lines of Sir George Beilby's report, instead of on the basis that existed before the war, they would be able to manufacture more cheaply, and consequently sell more cheaply, and at the same time greatly improve the fuel consumption of the country. In the past, the gas industry had been a voiceless industry—it had not been able to shout loud enough for itself; but he was quite sure that it was the basic industry as far as fuel conservation in this country was concerned.

Mr. Milne Watson mentioned that it had been hoped to have present, and to take part in the discussion, the Lord Mayor of Manchester in electricity; and he could assure the President of the Board of Trade, and Alderman Phillips of Salford. Although unable to attend, however, they were in entire sympathy with all that had been said.

Sir Auckland Geddes Replies.

Sir Auckland Geddes, having asked if any other gentleman wished to speak, replied to the deputation in the following terms: Mr. Milne Watson and gentlemen, I am very glad to have had the opportunity of meeting you to-day and to have heard the very interesting and full statements that have been made. I may say that, although I am not an expert in carbonization, I know enough of physics to take a very great interest in it and in the whole question of coal conservation. Naturally I am intensely interested in it. It is absolutely certain—and of this there can be no doubt, and I think there is no room even for captious criticism—there can be no doubt whatever, that the future of the country to a very great extent, to a larger extent possibly than the public has realized, both in peace and in war, is bound up with fuel utilization and those riches which you call the bye-products. They happen to be bye-products; but, as we all know, they are the basis of a very great many important industries, and in war are probably the one possible hope of success. So that you may be sure that when you come to the Government—particularly a Government that has had so recent and so terrible an experience of what war means—you speak to ears which are at all events understanding and sympathetic. It is obviously quite impossible for me to go into all the questions of detail that you have raised. There was one point raised by Sir Arthur Duckham as to the different kinds of coal which were being delivered by the Coal Controller to the same works—a difficulty which we have most fully realized and which, as I think you are aware, we are now taking steps to try to cope with. We appreciate fully the difficulties which have been created by the unfortunate necessity that different types of coal had to be delivered to the same works. With regard to the financial points which you have raised, I do not feel myself in a position at the moment to say more than this—that, given what I have said we recognize fully, the importance of the industry, clearly steps must be taken in some direction which will make it possible for the industry to carry on and develop; otherwise if it does not develop it must go backward as other things are doing. I do not know that there is more that I can usefully add this time, except to assure you that the Board of Trade are fully alive to the importance of your industry, and to the need for seeing it is not pushed to the wall.

Mr. Milne Watson thanked Sir Auckland Geddes, and the deputation withdrew.

NEW HOUSEHOLD FUEL AND LIGHTING ORDER.

There was contained in last Tuesday's "London Gazette" the text of the Household Fuel and Lighting Order, 1919, which is dated June 23, and came into effect on the 1st inst. There are in all eighty clauses, which occupy more than ten pages of the "Gazette." It should be read in conjunction with the Local Authorities (Fuel and Lighting) Order, 1919, and the Local Authorities (Fuel and Lighting) (Scotland) Order, 1919, both of the same date. The 1918 Order was dealt with fully in the Journal for July 9 last year [pp. 74-79]; and much of the new one is, of course, on the same lines.

Part I.—The Scope of the Order.

Coal, Gas, and Electricity for Domestic or Quasi-Domestic Purposes.

1.—The Order extends to coal, gas, and electricity used:—

(*a*) for heating, cooking, or other domestic purpose in any premises;

(*b*) for all purposes in a dwelling-house or in a building adjacent to or connected with a dwelling-house and occupied or used as part thereof, or in any premises used or occupied for residential purposes.

(*c*) for lighting purposes in any premises where the use of coal, gas, or electricity for any other purpose comes within the scope of this Order in virtue of provision (*a*) of this clause.

(*d*) for the production or generation in a private works of gas or electricity to be consumed in any premises where the use of coal, gas, or electricity for any other purpose comes within the scope of this Order in virtue of provisions (*a*) and (*b*) of this clause.

Where coal for any purpose coming within the scope of this Order is purchased, obtained, or in any way acquired with coal for other purposes, the Controller may declare that all the coal so purchased, obtained, or in any way acquired comes within the scope of this Order.

The decision of the Controller of Coal Mines shall be final and conclusive as to whether any particular premises or class of premises or the use of coal, gas, or electricity for any particular purpose comes within the scope of this clause.

Part II.—Duties of Consumers.

Maximum Quantities Allowed, Except on Certificate.

8.—Subject to the provisions of clauses 9, 10, and 11 hereof, no person being a consumer shall after the date upon which this Order comes into effect obtain for consumption or consume in any premises to which this Order applies, coal, gas, and electricity in excess of the following quantities, namely:

Coal: 5 tons in the year commencing with July 1, 1919; and
Gas: 12,500 c.ft. in any quarter; and
Electricity: 400 Board of Trade units in any quarter;

unless he has previously obtained from the Local Fuel Overseer a certificate in writing authorizing him to obtain for consumption or consume a larger quantity or larger quantities, in which event he shall not exceed the quantity or quantities shown on such certificate.

Allocation of Allowance Over Months of Year.

9.—The quantity of coal, gas, and electricity to which a person is entitled under the preceding clause in respect of any premises coming within the scope of this Order is hereinafter referred to as his allowance for such premises, and shall relate to a full year or quarter, as the case may be. In determining the allowance for any part of a year in the case of coal, the annual quantity shall be allocated to each month of the year in such a way that a consumer in a summer month (May to October inclusive) shall receive only half as much as in a winter month (November to April inclusive); but in the case of gas and electricity, the quarterly quantities shall be allocated equally to each month of the year.

Every allowance shall be for the year commencing from July 1, 1919, or for such part thereof as the premises concerned are in the occupation or use of the consumer in respect of whom the allowance is determined.

Conversion Equivalents for Coal, Gas, and Electricity.

10.—A consumer shall, on application to the Local Fuel Overseer of the district in which the premises are situate, be permitted as far as possible to take his allowance for such premises as coal, gas, and/or electricity in such proportions as he desires.

In making any alteration or variation in the quantities of coal, gas,

or electricity, the Local Fuel Overseer shall observe the following rules:

1.—A ton of coal shall be deemed to be equivalent to 18,750 c.ft. of gas.

2.—A ton of coal shall be deemed to be equivalent to 1000 Board of Trade units of electricity.

3.—A ton of coal shall be deemed to be equivalent to 30 cwt. of coke.

4.—Alterations or variations shall only be granted to the nearest quarter of a ton.

Provided always that a consumer may not, without the assent of the Local Fuel Overseer, elect to take for consumption more gas or electricity than the quantity taken in the previous year.

The Controller may, by notice at any time and for any district, alter the conversion equivalents set out in this clause, or may establish additional conversion equivalents without prejudice to any matters or things done under this Order, and without revision of any certificates issued under this Order.

Consumers to Give Information as Required.

12.—Every person, whether or no he requires coal, gas, or electricity, shall give such information or particulars with regard to any premises in his occupation coming within the scope of this Order or with regard to any stocks of coal on, or supplies of coal, gas, or electricity for, such premises as the Local Fuel Overseer may require for the purposes of this Order, and shall afford every assistance to enable any particulars or information given by him to be checked or verified.

Waste.

13.—No person shall waste or permit to be wasted any coal, gas, or electricity coming within the scope of this Order; and for the purposes of this clause, cinders capable of being further consumed shall be deemed to be coal.

Notice of Removal.

14.—Where a person is removing or about to remove from any premises coming within the scope of this Order, he shall give notice to the Local Fuel Overseer of such removal and of the address to which he is removing in such form as may be prescribed.

Where it shall be found that the quantity of coal, gas, or electricity consumed or acquired for consumption in such premises is in excess of the quantity properly allowed for consumption in respect of the period of time elapsed since July 1, 1919, or since the commencement of the allowance, such excess shall be brought into account by way of deduction from any new allowance of such occupier in respect of any new premises, subject to any adjustment in respect of the stock of coal which may be left behind at such first-mentioned premises.

Such action shall be without prejudice to any proceedings which may be taken against such consumer for failure to comply with the terms and provisions of this Order.

A person may be required, in respect of the occupation of any premises commenced after the date on which this Order comes into effect, to afford evidence to the Local Fuel Overseer of the district in which such premises are situate that he has complied with the requirements of this clause.

PART VI.—DUTIES OF UNDERTAKERS OF GAS AND ELECTRICITY SUPPLIES AND OTHER CLAUSES APPLICABLE THERETO.

Relief from Obligation to Supply.

53.—Where a company or undertaking supplying or offering to supply gas or electricity for reward (hereinafter referred to as an "undertaker of gas or electricity supply") is by reason of the provisions of this Order prevented from making a supply or from making a full supply to any consumer, it shall to that extent be relieved of any obligation resting upon it by statute or otherwise to make such supply.

Records and Returns.

54.—An undertaker of gas or electricity supply shall keep such records of its supplies to consumers as the Controller may require; and such records, together with any orders, receipts, or vouchers for such supplies, and the books and accounts of such undertaker, shall be open at all reasonable times to the inspection of the Local Fuel Overseer of the district in which the premises of any such consumer are situate, or of the Controller, or of any person duly authorized by either of them.

Further, an undertaker of gas or electricity supply shall make such returns to the Local Fuel Overseer or the Controller in such form as the Controller may from time to time direct for the purposes of this Order.

Meter Readings.

55.—An undertaker of gas or electricity supply shall take readings of the meters of all consumers not less frequently than once in each quarter, and such other meter readings as, in the opinion of the Controller, may be found necessary to ensure the observance of the restrictions on consumption laid down in this Order.

For the purposes of any accounts and returns required under this Order, the meter readings for each quarter shall be taken as nearly as possible to the quarter days set out in clause 5 hereof. The system of taking meter readings shall as far as possible proceed according to some regular arrangement each quarter, so that the interval between the readings of the meter of any one consumer shall be approximately three months.

The meter readings shall, for the purposes of this Order, be *prima facie* evidence of the quantity of gas or electricity consumed.

Restrictions on Fitting and Equipment of Premises.

56.—An undertaker of gas or electricity supply shall not, after the date on which this Order comes into effect, without the previous assent of the Local Fuel Overseer, make any new connection for the purpose of the supply of either gas or electricity coming within the scope of this Order, nor shall it fit or equip or permit or authorize to be fitted or equipped any premises with additional appliances for the purpose of using gas or electricity for fuel without such assent. This clause shall extend to any other persons undertaking the fitting or equipping of premises with appliances for the use of gas or electricity for fuel.

Removals; Failure to Give Notice.

57.—When a consumer fails to give notice of removal as required by clause 14 hereof, he shall for the purposes of this Order be assumed to have consumed the gas and/or electricity shown by the next meter readings after his removal.

Quarterly Return of Excess Consumptions.

58.—An undertaker of gas or electricity supply shall, not later than four weeks after the close of any quarter, make a return to the Local Fuel Overseer for each district in which it makes supplies showing for each consumer in such district the excess supply (if any) which such consumer has taken in such quarter for any premises in his occupation over the allowance or proportionate part thereof for such premises in accordance with the provisions of clauses 8 and 9 hereof.

Reserve Stocks of Coal; Gas and Electricity Undertakers.

59.—An undertaker of gas or electricity supply shall maintain such reserves of coal for the purposes of its undertaking as the Controller may determine, and shall report to the Local Fuel Overseer or Overseers concerned and to the Controller any case in which its reserve of coal is not maintained.

The Controller or the Local Fuel Overseer with the assent of the Controller may in such event direct such general reduction or limitation in the supply of gas or electricity to consumers as he may deem necessary to provide against a failure of supply.

PART VIII.—GENERAL.

Offences, Defence of the Realm Regulations.

70.—Any person who contravenes any of the provisions of this Order or who neglects or fails to comply with any requirement or obligation imposed on him by or in virtue of this Order, or who in any application, requisition, return, report, or other document in pursuance of or for the purposes of this Order, knowingly makes any false statement, shall be guilty of a summary offence against the Defence of the Realm Regulations.

Readjustment of Coal where Gas or Electricity Consumed in Excess.

72.—Where a consumer shall have taken, in connection with any premises, more gas or electricity in any period than his quarterly allowance, the Local Fuel Overseer may, in his discretion, reduce in respect of such premises the quantity of coal due to such consumer to such extent as appears to him to be reasonable.

Where such consumer shall have obtained all the coal due to him, the Local Fuel Overseer may similarly reduce the allowance of coal of such consumer for any future period.

Power to Cut off Supplies from Consumers.

73.—Any undertaker of gas or electricity supply may, and at the request of the Local Fuel Overseer, with approval given by or on behalf of the Controller, shall, cut off the supply to any consumer in respect of any premises at which more than the allowance for any period has been consumed in the period or prior to the conclusion of such period, and shall restore such supply on such terms and conditions as may be necessary to secure the observance of the restrictions on consumption laid down in this Order.

An undertaker of gas or electricity supply may, for the purposes of this clause, enter upon the premises of such consumer, and any costs to be incurred in connection with the cutting off or restoration of any supply of gas or electricity shall be borne by such consumer.

Any action taken under this clause shall be without prejudice to any proceedings which may be taken against such consumer for failure to observe the terms and provisions of this Order.

Contracts Affected by Terms of Order.

74.—Where by reason of any compliance with the provisions of this Order the fulfilment of any contract by any party thereto is interfered with, the necessity of complying with the provisions of this Order shall be a good defence to any action or proceeding taken against such party in respect of the non-fulfilment of such contract so far as it is due to such interference.

Repeals of Previous Orders.

77.—The following Orders are hereby cancelled, except in so far as any acts or things have been commenced or done under such Orders, and all such acts or things as have been commenced or done under such Orders as are in accordance with or meet the requirements and provisions of this Order shall continue in effect as if they had been commenced or done under this Order, namely:—

The Household Coal Distribution Order, 1917, dated Aug. 10, 1917.

The Household Fuel and Lighting Order, 1918, dated June 28, 1918, except as regards clause 127 of that Order.

The Household Fuel and Lighting (Scotland) Order, 1918, dated Sept. 18, 1918, except as regards clause 99 of that Order.

The Household Fuel (Prosecutions) Order, 1918, dated Nov. 28, 1918.

The Household Coal (Requisition) Order, 1918, dated Sept. 7, 1918.

Weymouth Gas-Workers' Strike.—A considerable amount of public inconvenience has been caused by a strike of the employees of the Weymouth Gas Company. The dispute was in connection with the award which was agreed to between the National Gas Council and the men's Union.

Kendal Gas Undertaking.—Reporting on the operations of the Kendal Gas-Works for the past financial year, Mr. W. R. Wilson (the Engineer and Manager) says the accounts show a surplus of £1128. There were carbonized 6160 tons of coal, with a make of gas of 96,760,000 c.ft. The quantity of gas sent out from the works, including that used for public lighting, was 87,940,400 c.ft., which was 330,900 c.ft. more than in the preceding year. During the year there was a saving of 643 tons, or 9·46 p.ct., of coal; the make of gas per ton of coal carbonized having been 15,707 c.ft. The vertical retort plant continues, after 3½ years' working, to give excellent results.

ANNUAL REPORT AT BELFAST.

The report of the Belfast Corporation Gas Committee upon the accounts for the year ended March 31 (which is signed by the Chairman, Alderman James Craig, J.P.) states that the gross profit on the manufacture and sale of gas and residuals is £44,488, which is a decrease of £7383 as compared with last year. Adding the profit of £2598 on the working of the stoves department, makes a total gross profit of £47,086. When dividend and interest charges are deducted, there remains a net profit of £22,263, which is less by £5872 than last year. With the balance forward, there is a total at the credit of the profit and loss account of £38,074, from which have been deducted the following items: Carried to stock redemption accounts, £9365; sinking fund and interest for purchase of old abattoir site, £1233; carried to reserve for insurance of works, £1600; carried to contingent renewal fund, £3000. This left a balance of £22,876, out of which £11,397 has been paid in dividends and sinking fund on new City Hall stock, so that there is a balance to be carried forward of £11,478.

From the analysis of the accounts made by the Engineer and Manager (Mr. James D. Smith), it is seen that the quantity of coal carbonized during the year was 133,712 tons, and of oil used 890,060 gallons. The quantity of coal gas made was 1,855,294,000 c.ft., and of water gas 808,800,000 c.ft.; the total being 2,664,094,000 c.ft., or 133,493,000 c.ft. (equal to 4·77 p.ct.) less than in the previous year. The gas made per ton of coal was 13,875 c.ft.; per ton of oil, 236,067 c.ft.; per ton of coke used, 48,324 c.ft. The oil used per 1000 c.ft. of gas was 1·1 gallons. The total quantity of gas sold was 2,534,852,500 c.ft.; the proportion unaccounted for being 4·85 p.ct.

In submitting the minutes of the Gas Committee to the City Council, Alderman Craig said the past year had been a time of great difficulty, one of the chief troubles being to get coal. They had to take practically anything that was offered, no matter how inferior; and it was often a trouble to produce gas from what was sent under the name of coal. The outlook for the present year was not much brighter, as owing to the miners having obtained increased wages and reduced hours of labour, the output was likely to be seriously affected; and this would inevitably tend to increase the price of what was available. It was practically certain that they would have to pay more for the coal required this year; and any further increase would necessitate a rise in the price of gas. The coal used in the past year amounted to 133,712 tons, a decrease of 13,861 tons; and the cost showed an increase of £17,697. Carbonization cost was £9353, a decrease of £2716 on the previous year. Oil used showed a decrease of 251,463 gallons. They had, however, to pay a much higher price per gallon; and consequently the cost of the reduced quantity of oil was £52,868, as against £40,238 for the previous year, an increase of £12,630. The wages bill still continued to rise. The total increase for the past year, as compared with the previous twelve months, was £9505. Owing to the rapidly-increasing costs of materials and stores of all kinds, the Committee had to raise the price of gas 2·4d. per 1000 c.ft. from Oct. 1. The total expenditure amounted to £493,383, an increase of £61,515; while the income was £537,871, or an increase of £54,132.

PREPAYMENT METER CHARGES AT BIRMINGHAM.

At a meeting of the Birmingham City Council on Tuesday last, Alderman J. H. Lloyd, the new Chairman of the Gas Committee (in succession to Alderman Sir Hallewell Rogers, M.P.), brought forward the report of the Gas Committee who had reconsidered the question of the amount of gas that should be sold to the consumers through prepayment meters. They felt that the quantity should be reduced to 19 c.ft. for a penny; and they therefore recommended that the charges recently approved be confirmed.

He pointed out that the question of prepayment charges was a complex one; and on investigation the Committee found several anomalies due to the practice, which was common throughout the whole gas industry, and was adopted in the Parliamentary Model Gas Bill, of charging for hire and maintenance of fittings, &c., in the price paid for gas by the automatic consumer. A very large number of the automatic consumers were not paying their full share of the charges for fittings, &c., owing to their small consumption of gas. If it were not for the large consumers through prepayment meters, the debit balance on this account would be much greater than it was now; and with the largely increased maintenance which had to be tackled immediately, the cost would be enormously increased. He impressed upon the Council and the prepayment consumers that the whole of the difference in price paid by them would be credited to the automatic account, and that if the Committee's estimate as to cost was not borne out, and the extra price charged placed the account in credit more rapidly than was anticipated, the Committee would not hesitate to come to the Council and recommend a re-adjustment in prices in favour of the automatic consumer. It was estimated that to instal and maintain the fittings supplied to the prepayment meter consumer in the smallest type of house would cost, at the present time, £5 7s. 3d. If this amount was spread over 15 years, it would require, at 19 c.ft. per penny, an average consumption of gas over the 15 years of 12,900 c.ft. to repay the cost; whereas the average consumption of the class of consumer who lived in this small type of house was below this figure. On the basis of ten years' redemption, 16,900 c.ft. per penny would be required.

An amendment was moved by Mr. Sabin that, as from the June reading of the meters, the charges for gas supplied to consumers through prepayment meters be altered from 19 c.ft. to 20 c.ft. per penny. After some discussion, Alderman Lloyd accepted the amendment, which was then approved by the Council.

The suspension of the whole of the street lighting during the next two months has been suggested by the Walthamstow Lighting Committee.

BIRKENHEAD GAS-WORKS EXTENSIONS.

Proposals of the Gas Committee to borrow £89,425 for extensions and renewals at the gas-works, were approved by the Birkenhead Town Council at a meeting last Wednesday.

Alderman J. H. M'GAUL, in submitting the motion that this sum be borrowed for extension of the gas undertaking, excluding items of £31,960 to be charged to renewals and reserve funds, said the Committee were asking for the absolute minimum of their needs. For cooking and heating, gas would certainly hold its own for many years. At present there were in the borough some 34,000 gas consumers; while the electricity users were between 3400 and 4000. During the last few months there had been a largely-increased demand; and the day load was now heavier than the night load. The gas undertaking last year made a gross profit of £49,430, and a net divisible profit of just on £19,000, of which £5980 was to go in relief of the rates, and £5900 to the reduction of price account. He hoped the Council would not make the mistake they did in 1908 of cutting-down the proposals, a policy which had cost the ratepayers many thousands of pounds. The works included modernizing of retort-houses (£35,600), reconstruction of gasholder (£10,000), wet purifying plant, scrubbers, &c. (£30,000), alterations to mains (£5000), extension of telpher plant track (£12,000), messroom and lavatories (£3700), and many smaller items.

Mr. D. J. CLARKE (the Chairman of the Electricity Committee) moved that the proposals be referred back. The *crux* of the whole matter, he believed, was the lighting of the new dwellings under the housing scheme. In other words, the Council were asked to sanction the expenditure of £120,000 for 2500 houses. The Gas Committee had wasted £10,000 in putting-up an electricity generating station for current that the Electricity Committee should have supplied. Within a short time the Corporation, as makers of electricity, would be abolished, and the Government would take over all the generating, leaving the Corporation as distributors only. Was it fair to cheat the Government out of the cream of their load—the supply of light? The more electricity was used, the better it was for humanity.

After discussion, the proposals were approved by a large majority.

THE GAS COMMITTEE'S REPORT.

In their report to the Council on the proposed extensions, the Gas Committee pointed out that the question of taking in hand certain extensions and alterations at the gas-works has been considered on several occasions during the war, both in connection with the recommendations of a Special Sub-Committee of the Gas Committee on questions of urgent matters of reconstruction, and as mentioned in Mr. W. Doig Gibb's report. It is now more than ten years since the last scheme of extensions was authorized. During this period, the undertaking has continued to expand, in consequence of which it became apparent prior to the war that further extensions were becoming necessary in order to meet the demand. The four-and-a-half years of war have prevented any steps being taken to carry out such extensions, though the demand for gas continues to increase. The total increase since the 1908 scheme is 250 million c.ft., equal to 25 p.ct.

The Committee are of opinion that the time has now arrived when any further delay in the substantial extension of the plant of the gas undertaking would in all probability have very grave results. As it is their desire, however, to postpone any expenditure which is not urgently called for, they have eliminated from the report of the Gas Engineer (Mr. R. H. Brown) various items which, though very necessary and desirable, are not so urgent as other works. The consideration of these items has been deferred for the time being, to be brought forward at a later date. Mr. Brown's final report was dated March 20, and summarized the whole matter of the proposed extensions—putting forward a large scheme. The daily output of gas available from the existing works is 26,220,000 c.ft.; and Mr. Brown calculates that from the extended plant it will be 32,130,000 c.ft.

The subjoined particulars taken from the report relate to some of the principal features of the extension scheme drawn up by Mr. Brown.

Conversion of No. 1 Horizontal Retort-House to Machinery.

In order to increase the manufacturing capacity of the plant upon the present site of the works, the remodelling of No. 1 Retort-House for the manufacture of coal gas is needed. The present house is old and inefficient, having been built in 1884; and it is proposed to remodel half of this house for working with machinery. The other half could then follow at a later date, when needed, at a very moderate expenditure. This work is very much overdue, and has now become very pressing, as for the last fifteen years at least the Council have been considerable losers by working the house with hand-stoked retorts. The cost of coal carbonized in this house is now 9s. 11d. per ton, or 9½d. per 1000 c.ft., against an estimated cost of 1s. 5½d. per ton, or 1½d. per 1000 c.ft. by the proposed system. If the department is to be carried on in the same economical manner as other gas-works, it is essential that this house should be converted at once; and this is one of the main points which have Mr. Doig Gibb's strongest support, and was particularly mentioned in his report. It is a sound financial proposition; the saving in working, quite apart from increased gas made per ton of coal and other features, amounting to at least £8850 per annum on the working of six beds.

This was originally included in the first telpher scheme; but it was then cut out on the score of economy. During the succeeding years, cartage rates have increased enormously; so that the cartage of coke to the water-gas plant, which four or five years ago cost about £300 a year now costs £1250 a year for about the same quantity of coke. The extension of the telpher plant is supported by Mr. Doig Gibb's report.

High-Pressure Main to New Ferry Toll Bar, and Distributing Governors.

In view of the continual growth of the undertaking, particularly in the out-districts, the increased consumption in the general area of supply, and the gradual extension of the mains, the pressure in the outlying districts has for some time past been deficient, and has necessitated the carrying of very heavy pressures at the works. Thus the

districts nearer to the works have had to support higher pressures than necessary, in order that the out-districts may obtain something like an adequate supply, to meet the complaints of Lower Bebington, Higher Bebington, and Bromborough, in particular. To improve the supply to this district, it is proposed to instal a high-pressure main from the works to a point near New Ferry Toll Bar, to boost the pressure, and instal a system of distributing governors.

Reconstruction of No. 2 Gasholder (Rope-Guided).

The want of stability of this holder has caused great difficulties and losses in working; and almost every year there is a loss of gas by its inefficient working, not to mention other difficulties and anxieties caused thereby. At least seven times during the past eleven years it has lost seal and come down with a run, with a consequent loss of gas; and these accidents always occur at most inopportune times, when the demand is fairly heavy. It can be taken that it costs on an average at least £250 a year to maintain this system.

Wet Purifying Plant.

This work has been long delayed; and the need for the plant has caused many difficulties in working. In common with many other works, production and storage power have been increased from time to time to meet the demand; but the extension to the wet purifying section for condensation, washing, and scrubbing of the gas for tar, ammonia, and carbon disulphide, has always been deferred. After the working of the vertical retorts commenced, the increased production of gas, and that gas with a higher temperature, overwhelmed the existing plant. Steps were then taken to obtain some additional condensers and washers, which were fixed temporarily; and to a great extent they have acted as a palliative, but have not effected an entire cure. It is necessary to clean out an old gasholder tank and transform it into wells. On the roof of this tank would be erected a wet purifier house, roofed with an overhead tank, which house would contain two water-tube condensers, two washers, and four rotary washer-scrubbers.

Sufficient power will then be provided efficiently to condense, wash, and scrub the gas, and recover the greatest quantity of valuable residuals up to the maximum coal-gas production of the existing works.

The Greenock Corporation Lighting Committee have decided to introduce the "A. & M." patent pressure-wave automatic controllers, together with the A. & M. hurricane proof lanterns, for the whole of their public lighting, which will mean some 2500 lamps all told.

On Saturday, June 28, the employees of Messrs. Pinchbeck, Ltd., of Holloway, held their outing at Southend-on-Sea. A very pleasant day was spent. In the afternoon, a visit was paid to Rochford. The usual toasts were proposed, and reference was made to the signing of the Peace Treaty, as the glad news had just been made known. The Stewards (Messrs. A. Barfoot and Charles White) are to be congratulated on their efforts to provide so splendid a programme.

A LOSS AT WEST BROMWICH.

For the first time in the history of the West Bromwich gas undertaking, a loss has been reported on last year's working—amounting to £927.

The annual report of the Treasurer states that the total income for the year on revenue account amounted to £95,844, an increase of £6200 on the previous year. The net income from sales of gas was £62,456, an increase of £5044. The total quantity of gas sold was 407,716,972 c.ft., a decrease of 19,987,998 c.ft. compared with the sales for the previous year. During the year the price of gas has been twice increased. The average obtained for all gas sold was 3s. 2·23d. per 1000 c.ft., less discount. The number of houses in the borough in November was 14,825, of which 5865 were supplied with gas by ordinary meters, and 6233 by prepayment meters. The total number of consumers of all classes was 12,489. The amount derived from residuals was £29,389, an increase of £1279 on the previous year. The receipts from the sales of gas-fittings, the sale and hire of gas stoves and fires, &c., was £3514, a decrease of £569.

The total expenditure on revenue account was £88,487, an increase of £9837. Manufacturing charges amounted to £69,176, or £6710 more. The net cost of manufacture, after deducting the income from residual products, was 1s. 11·42d. per 1000 c.ft., compared with 1s. 7·28d. the previous year; while the total cost, inclusive of all expenses and interest and sinking fund charges, was 3s. 2·08d. per 1000 c.ft.

The gross profit for the year carried to net revenue account was £7357, as compared with £10,993 a year ago. The net revenue account has been charged with £2076 in respect of interest on capital, £6003 for instalments towards the redemption of loans, and £204 being the fifth year's contribution towards the cost of the West Bromwich Corporation Act, 1913. The total loan charges amount to £8283. After these charges, there remains a net loss for the year amounting of £926, compared with a net profit of £2264 the previous year.

At the meeting of the Council last Wednesday, an increase of 6d. per 1000 c.ft. in the price of gas to ordinary consumers, and a reduction of 2 c.ft. per penny to prepayment customers, were agreed to.

Lancaster Gas Accounts Analysis.—The analysis of the accounts of the Lancaster Gas Department show a net profit last year of £3871, against £9814 for the previous year. Of this sum, £2500 was transferred to the borough fund for the relief of the rates. The receipts from sales of gas were £38,102, a decrease of £2042, attributed to the Fuel and Lighting Restriction Order. Residuals increased by £2422; but the total expenditure was greater than last year by £7860. For extending retorts and chemical plant, £5613 was paid; this being defrayed from the reserve fund, which now stands at £18,908. The only capital expenditure was £300 for water-gas plant.

Gas and the Housing Problem.

PENDING the necessary provision of new houses, the best has to be made of existing accommodation. The essential economy of space is secured by the use of the ideal Cookers in present circumstances — Main's "Kent," "Sussex" and "Surrey." These efficient and compact cookers embody all recent improvements and are designed with a view to securing the minimum cost for maintenance.

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CHORLEY GAS-WORKS ACCOUNTS.

In the course of his first annual report to the Chorley Corporation Gas Committee, Mr. Mark Newsome (the Gas Engineer and Manager), dealing with the year ended March 31, states that the total receipts amounted to £36,197, and the expenditure to £29,080, leaving a gross profit of £7117; the net loss being £2467, which compares with a net profit for the preceding year of £1346. Expenditure on capital account included £1756 on vertical retorts. War bonuses to employees accounted for £2085. Though 1711 tons less fuel was carbonized than in the preceding year, the outlay on coal and in depositing it on the works was £1054 more.

The quantity of gas made during the year was 168,728,000 c.ft., as compared with 169,863,000 c.ft. in the preceding year—a decrease of 1,135,000 c.ft., or 0·67 p.ct. The total quantity of coal used was 12,473 tons, being 1711 tons less than last year, though only 1,135,000 c.ft. less gas was produced. Presuming that the same amount of gas had been called for, the actual saving in coal due to increased efficiency obtained from the vertical retorts would have been 1618 tons less than last year, at the average price for the year delivered on the works resulting in a saving of £1969 on carbonizing account. These results from April 1 to date have been greatly improved upon. The average yield per ton of coal carbonized was 13,527 c.ft., as compared with 11,915 c.ft. a year ago, an increase of 1612 c.ft. per ton, which, if compared on a thermal basis, equalled 6,357,690 B.Th.U. per ton this year, as against 5,957,500 B.Th.U. last year—an increase of 400,190 B.Th.U. per ton. These results have been obtained with a coal chiefly composed of slacks, which are most unsuitable for use in continuous vertical retorts.

The total number of consumers at March 31 was 9692—4756 by ordinary and 4936 by automatic meter. The number of cooking appliances in use at the end of the year was 6884, as against 6719. There are now 159 gas-engines at work in the area of supply.

Mr. Newsome adds: Though during the past year a net loss has been experienced of £2467, I feel sure the Committee, by their action in appointing a Sub-Committee to consider whether it is necessary or otherwise to interfere with the present gas charges, indicate that they are desirous of taking no action, if possibly avoidable, which will tend to reflect adversely upon the very satisfactory increases of gas consumption now being recorded from month to month. It is very essential that the vertical retort plant be worked to its fullest extent—particularly with the present process of steaming the charges. The past year, as far as the carbonizing results are concerned, is a record in the history of the undertaking; and during the current year there is very little doubt that they will be greatly improved upon—more particularly so if the Committee are successful in obtaining supplies of fuel more suited to the process of continuous carbonization than are the slacks now being purchased.

BURNLEY GAS ENGINEER'S REPORT.

Mr. J. P. Leather, the Gas Engineer to the Corporation of Burnley, reporting to his Committee on the working of the department for the year ended March 31, says he has to record greater changes in the conditions and costs of manufacture than in any previous year in his experience. The culminating year of the war has seen unprecedented rises in the cost of materials and labour, which still continue.

The make of gas during the year was 702,773,000 c.ft., which was a decrease of 7·25 p.ct. on the previous year—largely due to the Household Fuel and Lighting Order. The presence of impurities in the coal increased the labour on gas manufacture and purification, and adversely affected the quality and quantity of the coke for sale. The poorer quality of the coal, too, was accompanied by an increase in its cost; the price paid per ton having been 25s. 5d., as compared with 20s. 9d. in the previous year. Gas oil per gallon cost 17·21d., against 9·98d. The cost of wages per 1000 c.ft. of gas rose from 10·77d. to 16·64d.; and Mr. Leather points out that the increase of nearly 6d. per 1000 c.ft. as compared with the previous year does not represent the whole effect of the advances of wages that have taken place, as these advances have only been operative during a portion of the year.

In June, 1918, the Minister of Munitions issued an Order under powers conferred upon him by Regulation 8 G. of the Defence of the Realm Regulations, which laid down general instructions how the manufacture of gas should be carried on. Where gas-works do not possess carburetted water-gas plants, the calorific power was to be as nearly as possible 500 B.Th.U. per c.ft. before scrubbing—that is, before the extraction of benzol and toluol. Subject to this provision, no minimum limit was laid down for the gas as delivered. Where, however, it was necessary to add water gas, the gas was not to be less than 450 B.Th.U. as actually delivered. No gas oil was to be used without the express permission of the Minister of Munitions, except so far as was necessary to maintain the standard of 450 B.Th.U. Reliable figures of the calorific power are only available for four months of the year. They are as follows: December, 1918, 475 B.Th.U.; January, 1919, 477 B.Th.U.; February, 469 B.Th.U.; March, 468 B.Th.U.

The quantity of sulphur in the gas averaged 13·91 grains per 100 c.ft. While not a high figure, this shows a larger amount of sulphur than it has been the custom to send out when using Burnley coal alone. During the past year, there have been 700 to 800 grains of sulphur per 100 c.ft. in the crude gas before purification, as compared with the customary figure of 450 to 500 grains. There has therefore been much greater strain on the purification plant. The great demand for sulphuric acid for munition purposes enabled spent oxide to be sold at a high price, thus reducing the cost of purification. During 1918, however, the manufacture of sulphuric acid overtook the demand, and many vitriol plants were, by the order of the Ministry of Munitions, worked at considerably below their capacity, producing a glut of spent

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oxide, while at the same time the cost of new oxide was increased. The cost of purification therefore increased during the past year from 0·07d. to 0·43d. per 1000 c.ft. of gas sold. In some cases it was practically impossible to obtain materials for the maintenance of plant; but nevertheless the cost of keeping things going increased from 3·58d. per 1000 c.ft. of gas sold in 1917-18 to 5·88d. in the past year. Figures relating to tar distillation show a balance of 52s. 1d. per ton on the 2711 tons of tar produced during the year. A reduction should, however, Mr. Leather says, be made for the quantity of gas used in distillation, valued at £1468. The net receipts for tar were therefore £5756, which equals 41s. 6d. per ton of tar.

The number of meters now in use is 29,165, of which 16,226 are prepayment. The amount of money collected from prepayment meters was £42,137; and the gas sold in this way, calculated at the ordinary prices, corresponds to £36,109—a difference of £6028. To show that the difference in price charged is fully justified, Mr. Leather states: The prepayment meters at the present time cost 38s. 9d. each more than ordinary meters. The original average cost of the meters in use only exceeded the cost of ordinary meters by about 25s., at which figure the 16,226 prepayment meters represent an extra capital outlay of £20,282. Interest on this at 5 p.ct. amounts to £1014. With these meters, we supply 12,082 breakfast cookers, at a capital cost of £6040. The life of these cookers is very short. We are continuously repairing and renewing them. It is therefore fair to charge interest and depreciation at 12½ p.ct., amounting to £755. The annual cost of meter repairs has been £2626. At least 50 p.ct. of this is due to the prepayment mechanism—say, £1300. Totalling these items we have: Loss on meter rent, £811; cost of collection, £1957; interest on outlay, £1769; repairs of mechanism, £1300—total £5837.

Recent advances in the rate of wages will considerably increase the items of collection and repairs.

OLDHAM GAS-WORKS RESULTS.

The annual statement of accounts and the statistical tables for the year ended March 25, compiled by the Borough Treasurer have been submitted to the Oldham Corporation Gas Committee by Mr. Ernest Parry (the Commercial Superintendent), who says the gross revenue amounted to £290,024, and the expenditure to £249,919; the balance carried to profit and loss account being £40,105. Deducting interest and sinking fund charges, left a net profit on the year's working of £9809. The debit balance brought from the previous year was £9650, and the amount contributed to the borough fund £7500, leaving a debit balance to be carried forward of £7341.

The average cost per ton of coal used during the year was 4s. 4·61d. more than in the year previous; but owing to the very marked progress made in the carbonization department, the total amount paid under this head has been reduced by £6709. The past year has been most difficult as regards coal deliveries; but, by a full use of the water-gas plant at Hollinwood, and the adoption of the improved methods of carbonization referred to, the winter season was got through without serious inconvenience. The net price realized per 1000 c.ft. of gas sold during the past year was 3s. 2·11d., as compared with 2s. 6·28d. in the year previous. The quantity of gas consumed by public lamps was 28,557,000 c.ft. As compared with the last year of normal lighting, this shows a reduction of 74,397,000 c.ft.

During the year there was paid by way of war wages the sum of £30,107, an increase of £17,806. This will be further increased during the current year, other wage concessions having been granted since March 25. This figure does not by any means represent the total increase in wages paid, as many employees have had an increase in their ordinary rates which have not been described as war wages.

The quantity of gas manufactured was 1,504,665,000 c.ft., against 1,553,865,000 c.ft. in the preceding year—being a decrease of 49,200,000 c.ft. The amount of coal used was 92,226 tons. The average make of gas per ton of coal carbonized was 14,955 c.ft., as compared with 12,214 c.ft. in the previous year. This has resulted in a saving of 20,696 tons of coal. The quantity of gas unaccounted for was 134,356,200 c.ft., or 8·9 p.ct.

The total number of meters fixed at March 25 was 56,172, of which 10,353 are of the prepayment type. The actual number of consumers was 51,723. There was a decrease in the quantity of gas consumed in houses and shops of 22,952,400 c.ft., and a decrease of 34,552,100 c.ft. in mills and workshops.

Mr. Parry concludes: Some months ago you placed an order for a new type of gas plant. We are expecting this plant to be in operation before the commencement of the next winter season; and its use should result in a very material reduction in manufacturing costs. Every effort is being put forward to popularize the use of gas for all domestic purposes; and very shortly a house-to-house canvass by a specially trained staff will be commenced. During the past five years mainlaying has been practically suspended. There is now a large accumulation, some of which has become urgent, and will have to be carried out during the current financial year. The cost of this work is about treble what it was in pre-war days. It is also advisable that two dismantled holders should be re-instated at the earliest favourable moment.

Gas Consumption in Glasgow.—The Gas Department of the Glasgow Corporation are at present contemplating the introduction of the latest and most perfected plant at the gas-works, where that is necessary. The desire is to cheapen production. The closing-down of large munition works has led to a marked reduction in the demand for gas; and the rationing scheme has also effected a falling-off in consumption. The charge for gas in Glasgow is 4s. per 1000 c.ft. In 1916 the rate was 2s. 6d.

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BURNLEY GAS UNDERTAKING.

When the minutes of the Gas Committee were presented at the Burnley Town Council meeting, Mr. Sutcliffe moved, as an amendment, that they invite an expert to report upon the gas-works.

The department came in for some criticism. Mr. Brumbley stated the deficiency last year was £15,687, and the estimated loss next year £10,000. The retort mouths had been going bad for some time, and the Committee had not been informed. The Committee ought to have had the knowledge before them so that they could raise the price of gas. Last quarter it was raised 6d., and there was an increase of 8d. this quarter—making a total of 1s. 2d. The Chairman had told them when he mentioned that Nelson was making £12,000 that they charged 4s. per 1000 c.ft. They charged 3s. 6d. in the first part of the year, and 4s. in the second. Oldham had made, roughly speaking, £9309 net profit, of which £2500 went to relieve the rates. Oldham had only charged from 3s. 1½d. to 3s. 5d. during the twelve months. Blackpool made over £10,000, and all the coal had to be either carted or conveyed by rail 16 to 18 miles. If the Burnley Committee had been taken into the confidence of the Manager, this sudden rise would not be necessary. They would have kept prices in front of the cost of manufacture, and not have a deficit of £15,000, which was a disgrace to the Chairman, the Committee, and the Manager.

Alderman Emmott (the Chairman) said Mr. Brumbley knew very well the department's limitations in regard to the price charged for gas. He had referred to the position at Oldham. The calorific value there was 425 B.Th.U. and no more. If they made gas of 425 B.Th.U. in Burnley, they could reduce the cost of manufacturing it to a considerable extent. The Council could have what they wanted in calorific value. They could put it up to 550 B.Th.U.; but up went the price to a considerable extent. At the best the inclined retorts lasted four years; but at Burnley they had gone on with them for seven or eight years and longer. Therefore, it was natural that they should be in bad condition, and it was taking them all the summer to change the settings and get them ready for the winter. This would improve the position to some extent, but even so the retort mouths were still bad. They were trying to get retorts. The verticals were doing very well at present; but the inclines were doing badly. Of course, they were stopped now; but they had not done well during the winter, and had gone on wanting repairing. By next winter, however, one set would be renewed, and the other set would be repaired next summer.

The amendment was eventually carried by a large majority.

The day following, Mr. J. P. Leather, the Gas Engineer, addressed the following letter to each member of the Council:

I write to protest against the resolution passed by the Town Council yesterday, in which it was proposed to call in an expert to report on the gas undertaking. I am the expert in charge of that undertaking, and no expert who can be engaged can speak with greater authority on any question relating thereto. Full information has already been given to the members of the Council; and I cannot believe that they have read the annual report and the information presented to them about ten days before the meeting. If they had done so, many of the criticisms would not have been made, as the majority of them were anticipated. The remainder may be accounted for by insufficient knowledge of the process of gas manufacture. I will reiterate a few elementary points.

The wages of labourers in 1913 were £1 3s. 8d. for 49½ hours per week. At the present time, £3 1s. 0½d. is paid for 47 hours. Stokers are paid £4 12s. 9d., as compared with £2 3s. 1½d. in 1913. The price of coal was 14s. 8d. and is now 26s. per ton. Can anyone at the present day be unacquainted with the inferiority of its quality? The price of gas oil has increased five-fold in the same period. Other materials have doubled or trebled in price. The reduced output of gas, owing to the Household Fuel and Lighting Order and other causes, considerably increased the cost of production.

If the Burnley Corporation had not had an unusual restriction in its Act of Parliament, the price of gas might have been increased over a year ago to an extent which would have rendered unnecessary the depletion of our reserve fund, and thus enabled us to use that fund for the exceptional expenditure of the present year.

In conclusion, I should like to point out that I am a member of the Council of the Institution of Gas Engineers, ex-President of the Manchester and District Institution of Gas Engineers, and also Vice-President of the Refractory Materials Committee for the Gas Industry. Although I am confident that any efficient and independent expert would report favourably on the undertaking and its management, the fact that the Corporation thought it necessary to make such an inquiry would always remain a stigma on my professional reputation. I wish to emphasize that in 1917, following upon a similar agitation, a Committee was appointed to investigate the working of the gas undertaking, who probed into the details of every phase of the concern and compared them with those of similar undertakings with favourable comparison for Burnley.

Before such an inquiry is made, I demand a statement of the ground for making the same.

Cowes Gas-Works Balance-Sheet.—When presenting to the Cowes Urban District Council the gas-works balance-sheet for the year ended March 31, Mr. G. Jackson pointed out that the make of gas had been 70 million c.ft., or an average of 14,990 c.ft. per ton of coal carbonized, as against about 12,000 c.ft. last year. In other words, they had made 6 million c.ft. more gas from the carbonization of 649 tons less coal. If the make per ton had not exceeded that of the previous year, they would have required 1100 tons more coal to have achieved the result actually arrived at. However, the coal bill was £377 more, owing to the Controller compelling them to take seaborne coal. There was a satisfactory surplus of £5653 carried to profit and loss account.

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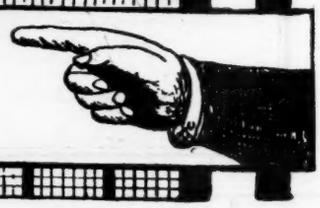

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July 7.*

The London market for pitch remains substantially unchanged. Pitch is firm and the minimum price is 65s. net per ton f.o.b. at makers' works. It is announced that the Committee officially set up in Paris some little time ago for the combined purchase of French requirements of pitch is to be dissolved. Consequently, the individual briquette manufacturers will in future purchase their supplies of pitch as they choose. Solvent naphtha is in rather better demand; but the price is unaltered. Crude carbolic acid is still in the position that it cannot be produced at the price the crystal makers wish to pay for it. Creosote is worth about 5½d. net per gallon in bulk. Motor purposes absorb large quantities of benzol.

There is nothing new to report in the home market for sulphate of ammonia.

Tar Products in the Provinces.

July 7.

The average values for gas-works products during the week were: Gas-works coal tar, 34s. 6d. to 39s. 6d. Pitch, East Coast, 56s. to 58s. 6d. per ton f.a.s.; West Coast—Manchester 48s. to 50s.; Liverpool, 48s. to 50s., Clyde, 55s. to 57s. 6d. nominal. Benzol 90 p.ct., North, 1s. 8d. to 1s. 10d.; crude, 65 p.ct., at 120° C., 11d. to 1s. naked at makers' works; 50-90 p.ct. naked, North, 1s. 8d. to 1s. 10d. Toluol, naked, North, 2s. to 2s. 1d. nominal. Coal tar crude naphtha in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 11d. Heavy naphtha, North, 2s. 3d. to 2s. 5d. Creosote in bulk, North, liquid. 5d. to 5¼d.; salty, 4½d. to 4¾d. Heavy oils, in bulk, North, 6d. to 6½d. Carbolic acid, 60 p.ct., 1s. to 1s. 1d. Naphthalene, £16 to £18; salts, £5 to £6, bags included. Anthracene "A" quality, 7½d. to 7¾d. per minimum 40 p.ct.

FROM A MARKET CORRESPONDENT.

Tar Products.

Conditions show no material alteration on the week. Higher prices are confidently predicted for pitch, and Manchester sellers are looking to 65s. in the near future. There is not a great deal of actual business at the moment, nor is it expected for a couple of months; but inquiries give cause for much encouragement. Some anxiety prevails in South Wales among the patent fuel makers; but they have only themselves to thank very largely for the present position. Business in crude tar continues good, and prices exhibit an advancing tendency. There is very little doing in naphthalenes, and a dull tone prevails particularly in the refined. Crude is a little firmer on the approach of the buying season for the fire-lighter trade. Naphthas continue as last reported, with a slightly harder tendency in solvent. Toluol is steady, and benzol is very firm, although some quarters report a lessening in demand, which may probably be due to the lower prices for petrol. There seems to be no immediate prospect of a further fall in petrol values. Even so, benzol is well able to hold its own. The public, however, still needs to be educated to its undoubted advantages; and propaganda is necessary. Cresylic acid is firm at the lower rate. Very little crude carbolic acid, however, can be sold; while no recovery in crystals is to be noted yet. The market seems to have been completely ruined by the falling off in the demand for explosive purposes. Other products are without change.

The range of quotations is as follows:

Benzol: 90% London 2s. to 2s. 2d., North 1s. 11d. to 2s.; 50-90% 1s. 9d. to 2s. London, 1s. 9½d. North; crude 60-65% 1s. 3½d. to 1s. 5½d.; pure, 3s. per gallon naked.

Carbolic Acid: Crude 60's unsaleable; crystals 40%, 4d. per lb. asked.

Crude Tar: London, 44s. to 46s.; Midlands, 40s. to 42s.; North 40s. per ton *ex* works.

Pitch: London, 67s. 6d. to 70s. per ton; East Coast, 54s. to 56s. per ton, West Coast, 51s. to 53s., with Manchester 52s. per ton and Glasgow 53s. 6d. per ton; South Wales, 63s. to 65s. per ton.

Solvent Naphtha: London, 2s. Provinces average 1s. 10d. per gallon.

Crude Naphtha: Naked, 10d. per gallon.

Heavy Naphtha: 2s. 3d. per gallon.

Naphthalene: Refined, £15 to £17 per ton nominal; crude, £3 10s. to £8, according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North 2s. 7d.

Creosote: London, 7¼d.; North, 5¾d. to 6¼d.; heavy oil, 6d. per gallon in bulk.

Anthracene: 40-45%, 6d. to 8d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Aniline Oil: 1s. 2d. per lb.

Cresylic Acid: 95%, 2s. 4d. to 2s. 6d.; 97-99%, 2s. 7d. to 2s. 9d. *ex* works London, f.o.b. other ports.

Sulphate of Ammonia.

Very little is heard of export business in this product, which, in ordinary conditions, would be somewhat surprising in view of the fact that this is the slack season. For the present, it seems, the make is to be reserved for home uses; and the position is very much bound up with what happens in nitrate of soda conditions. There are said to be very heavy stocks ready for shipment from Chile, and producers there are pressing the Government to reduce the duty. At the same time freights are falling, and shipping is becoming rather more plentiful, although there is still much room for improvement. It must also be

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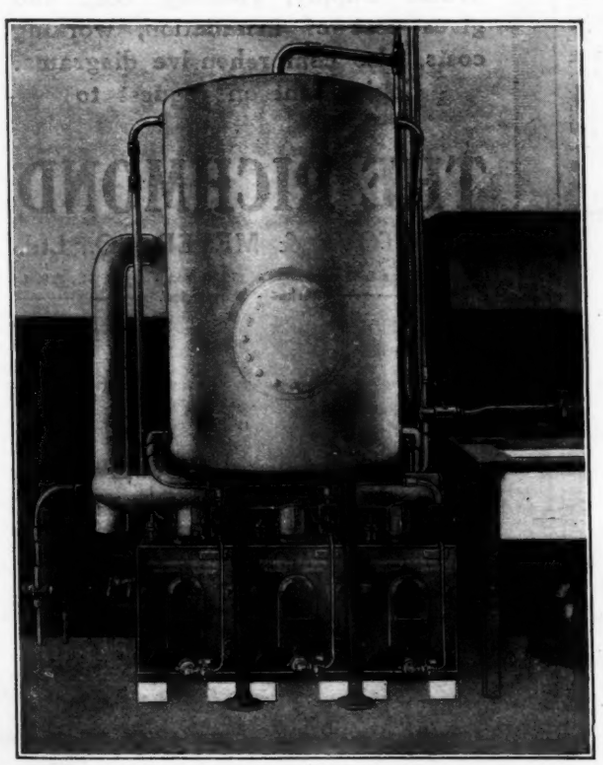

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remembered that, if little progress has been made in synthetic production of nitrogen here, much has been done elsewhere, particularly in Norway, according to Messrs. Montgomery & Co.'s report on the nitrate of soda situation, which clearly shows that we can no longer treat the matter with indifference. The result of these conditions may be to so reduce the price of nitrate of soda that the farmer will prefer it to sulphate; thus releasing an increased amount of the latter for export. And none too soon, for America is all ready to ship to some of our pre-war markets at under £20 per ton f.o.b., and German competition has to be faced nearer at home than was dreamed of six months ago.

The Purchase of the Chelmsford Gas Undertaking.

It has been resolved by the Chelmsford Town Council at a special meeting that the sum of £105,835 which the Council require to borrow and re-borrow under the Chelmsford Corporation Gas Act, 1915, for the purpose of defraying the purchase price of the undertaking of the Chelmsford Gas Company, and for paying sums payable by the Corporation to the Company or to their Directors, officers, and servants by way of compensation, and defraying costs, charges, and expenses incident to the purchase and to the winding-up of the Company, be borrowed from the London Joint City and Midland Bank, Ltd.; and that the sum, together with interest at the rate of 5 p.ct. per annum be repaid in 35 years by half-yearly instalments of principal and interest combined, subject to the Corporation or the Bank having the right to pay off, or require repayment of, the balance of principal outstanding at any time upon six calendar months' notice. The Gas Committee have adjourned consideration of the question of further increasing the price of gas, which may be necessary owing to the Council now being required to provide and pay out of the revenue of the gas undertaking the annual instalments of principal repayable in respect of the loans borrowed to defray the cost of acquiring the undertaking.

Gas-Mantles for Belgium.—An agent at Montigny-sur-Sambre desires to obtain an agency in Belgium for gas mantles, burners, chimneys, &c. The inquirer claims to have a large connection. Communications addressed to the Department of Overseas Trade (Development and Intelligence), No. 73, Basinghall Street, E.C.2, should bear the reference: "Belgium, No. 57."

Coal Shortage and Gas Supply in Australia.—A Reuter cable from Melbourne last Wednesday stated that drastic regulations restricting the use of gas and electricity have been issued by the Australian authorities, in consequence of the coal shortage. The new restrictions entirely prohibit electric radiators and gas-fires. All lights must be extinguished by 10.30. The "Age" says: "The strike for six weeks has been causing suffering among the wage-earners and the poor. The Federal Government, however, must enforce the recognition of the law." The seamen, whose strike has been largely instrumental in causing the coal shortage, have so far been unable to see the Acting Prime Minister. The employers are generously contributing to the relief of the widespread distress.

Quality of Gas in the Metropolis.—The reports of the London County Council Gas Examiners, state the Public Control Committee, showed the presence of sulphuretted hydrogen in the gas of the South Metropolitan Gas Company at the Hill Street testing-station on Dec. 6. The Company lodged an appeal; and the case was heard by the Chief Gas Examiner on May 13, when he decided that the impurity was due to difficulties arising out of the war, and might be deemed to be unavoidable. The report of the Examiner was accordingly cancelled. On the same date, the Chief Gas Examiner heard appeals by the Gas Light and Coke Company against reports showing deficient calorific power at the Camden Street, Kingsland Road, Ladbroke Grove, and Lambeth Road gas-testing stations on Nov. 4, Jan. 23, Feb. 21, and March 31, respectively. The Chief Examiner decided that all the reports must stand; and he imposed forfeitures of £5 in each of the first three cases, and £8 in the last.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for July 2.]

Nos. 15,694—16,332.

EWART, J. W.—"Water-heaters." No. 16,328.
GALUSHA, A. L.—"Gas-producers." No. 15,916.
GEORGE, T. A.—"Means for regulating supply of air and gas to incandescent gas-fires, &c." No. 16,037.
GEORGE, T. A.—"Incandescent gas-fires." No. 16,038.
JACKSON, W. J. MELLERSH-.—"Coking retort-ovens." No. 15,803.
Koppers Company.—"Coking retort-ovens." No. 15,803.
LJUSNE-WOXNA AKTIEBOLAG.—"Method of producing gas for driving gas-engines." No. 16,127.
MEADE, A.—"Manufacture of water gas." No. 16,311.
MELDIA MANUFACTURING COMPANY.—"Diaphragms for gas-meters and bellows." No. 16,324.
MELSOM, C. L. E.—See Meldia. No. 16,324.
METERS, LTD.—"Recording-devices." No. 15,931.
MURRAY, F.—See George. Nos. 16,037, 16,038.
PERDRISAT, C.—"Apparatus for carburetting lighting and heating gas." No. 15,899.
PERRY, W. P.—"Apparatus for distilling carbonaceous material." No. 15,985.
POPE, H.—"Gas-mantles." No. 15,939.
RUDGE-WHITWORTH, LTD.—"Means for ascertaining composition and effect of gases, &c." No. 15,716.
SIMPSON, S.—"Coin-freed mechanism applicable to gas, &c., meters." No. 15,723.
WEST, J.—"Conveyors, &c." No. 16,115.
WEST'S GAS IMPROVEMENT COMPANY.—See West. No. 16,115.

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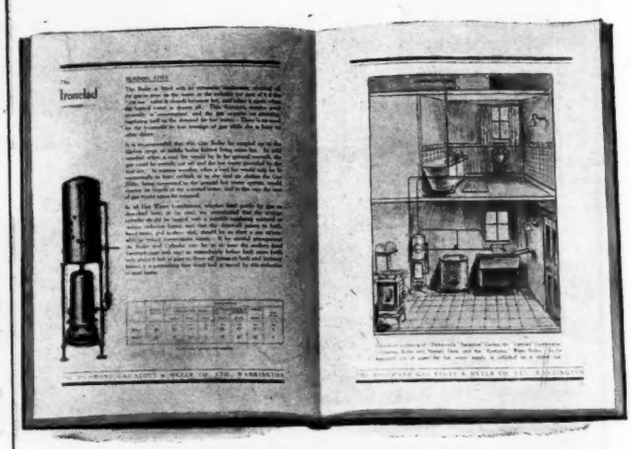

Hastings Gas-Workers' Strike.—The strike of Union employees of the Hastings and St. Leonards Gas Company, over the refusal of the Company to compel two ex-service men to join the Union or to dismiss them, has ended. The facts of the dispute were set forth on p. 34 of last week's issue of the "JOURNAL." The questions of a 47-hour week for day workers and of an increase in wages the men have agreed shall be submitted to arbitration.

A Profit at Bradford.—A statement submitted recently to the Bradford Gas Committee showed that the working of the gas undertaking for the year ended March had resulted in a net profit of £670, as compared with a loss of £31,700 in the previous year. The income from the sale of gas had increased by £62,100, and from the sale of residuals by £12,000. The price of gas was increased on Jan. 1 from 3s. 4d. to 4s. per 1000 c.ft. The cost of manufacture increased by £34,000, of distribution by £5000, and rates and taxes were more by £2300. Allowances to dependants of men in the forces increased by £1400. Sales of gas fell off by 32 million c.ft., as a result of the rationing system. The gross profits, before payment of interest and sinking fund charges, were £55,400.

Price of Gas at Whitchurch.—The Whitchurch (Salop) Gas Company, Ltd., have been compelled to notify an increase of 4d. per 1000 c.ft. in the price of gas to ordinary consumers. The rates will then be 4s. 7d. net for lighting only, with a discount of 5d. for cooking and heating, and of 10d. for engines. To slot-meter consumers the price will be 4s. 11d. per 1000 c.ft., or 17 c.ft. for a penny. These advances are only the second since 1914. In the case of the ordinary consumers they total 22 p.ct., and in that of the prepayment meter users 18 p.ct.

Gas Profits at Bollington.—At a meeting of the Bollington (Cheshire) Gas Committee, a statement of accounts for the year ended March 31 was submitted. The gross profit on the gas undertaking was £883, as compared with £900 in the previous year. It was decided to transfer £300 to the relief of the rates. It was also resolved that, in order to meet the unavoidable increase in expenditure during the current financial year, the price of gas to ordinary consumers should be increased 6d. per 1000 c.ft. from the next reading of the meters, and that the discount of 2½d. p.ct. to slot-meter consumers be temporarily discontinued.

STOCK MARKET REPORT.

AFTER a patriotic start in the shape of singing the National Anthem, the Stock Exchange on Monday prepared itself seriously for business. In Home Government issues, the dulness was most marked, and prices grew steadily weaker day by day. Thus on Friday the 5 p.ct. Loan touched 93⅝, and Consols 52½. The sale of these for reinvestment in the New Loans was said to be the cause of the fall to a considerable extent. Even the short-dated Bonds failed to maintain their firmness, and gave way towards the close. Indians, too, were easier. Home Rails were not much dealt in, being dulled with apprehension regarding future conditions of the industry.

In the Foreign Market there was hardly a bright spot. French Loans were depressed by the continued fall in the exchange, which brings the present value of the franc at rather less than 8d., and the state of affairs in Russia depressed the market. Even in the Miscellaneous Market there were many more dark spots than bright. But in Oils there was great activity in several concerns, coupled with smart advances in value, and Shipping continued to be in good demand. Rubber was quiet.

Business in the Gas Market could perhaps claim to be just a shade less inactive than in the week before; but after all it did not amount to much, and did not offer any incident of particular interest. Movements were again irregular, and the prevailing tendency was for the most part in favour of lower values. The Metropolitan undertakings were not strong. In Gas Light and Coke, the maximum gave way a point; but the other issues were unchanged. South Metropolitan changed hands once at 55, and the quotation was lowered 2½. Commercial had but one transaction, which brought the quotation down 1. Among the Suburbans, Bournemouth 10 p.ct. fell a point. In the Continentals, Imperial touched 143 on Monday, but was down to 138 on Friday, with a fall of 3 in the quotation, and Continental Union made a similar movement. But Primitivas were cheered by advices that a Municipal Committee had reported favourably of the Company, and both share issues had a rise.

Bargains done for cash during the week were as follows: On Monday, Cape Town 6⅜, 6½, Gas Light ordinary 57½, 58½, ditto maximum 54¼, ditto debenture 55, Imperial Continental 140½, 142, 143, Primitiva 37s. 6d., ditto preference 65s., 67s. 6d., South Metropolitan 59. On Tuesday, the Stock Exchange was closed. On Wednesday, Commercial 4 p.ct. 61½, Gas Light ordinary 57½, 57¾, 58, 58¾, ditto maximum 53, Imperial Continental 140, 141, 141½, 142, Oriental 102, Primitiva 36s. 10½d., ditto preference 66s. 10½d., 69s. 4½d., 70s., 70s. 7½d., 71s. 3d., San Paulo preference 7⅞. On Thursday, Gas Light ordinary 57⅜, 57⅞, 58, 58½, ditto preference 71, Imperial Continental 139, 140, 140½, Primitiva 40s. 7½d., ditto preference 70s., 72s. 6d., South Metropolitan 59½, 59⅝, Oxford 5 p.ct. ordinary 41. On Friday, Bombay 5⅞, Bournemouth 10 p.ct. 10⅝, ditto "B" 10$\frac{11}{16}$, Continental Union 45, Gas Light ordinary 57⅛, 58½, ditto preference 71, Imperial Continental 138, 138½, 139, 139¾, 140, Monte Video £13 0s. 9d., Primitiva 37s. 6d., 39s. 9d., 40s., 42s. 6d., ditto preference 70s., South Metropolitan 55, 57, 58, 59, ditto debenture 55, South Suburban 78, Tottenham "B" 64⅞.

In the Money Market extreme ease ruled; the supply being largely in excess of all requirements. Discount was very quiet; and here, too, rates were quite easy. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 26, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
182,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	62—67	..
1,851,868	"	April 8	2½	2½%	Alliance & Dublin Ord.	59—64	56—60	..
274,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	61—68	..
280,000	5	April 29	7½	8%	Bombay, Ltd.	5⅞—6⅛	5⅞—6⅛	5⅞
50,000	10	Feb. 26	15	12½	Bournemouth Gas and Water { 10 p.c.	20 - 30	19½—20½	19⅞
					{ B 7 p.c.	15—15½	10½—11½	10$\frac{11}{16}$
333,110	10	"	7	7%	{ Pref. 6 p.c.	13½—14	9½—10	..
115,000	10	"	6	6%	{ 4 p.c. Deb.	..	65—67	..
159,740	—	June 27	—	4%	Brentford A Consolid.	261—266	74—77	..
999,045	Stk.	Feb. 26	14	37/-	Do. B New	204—209	68—71	..
784,920	"	"	11	31/8	Do. 5 p.c. Pref.	109—111	78—83	..
55,000	"	"	5	5%	Do. 4 p.c. Deb.	91—98	84—66	..
221,400	"	June 11	4	4%	Brighton & Hove Orig.	208—218	137—142	..
214,775	"	Feb. 26	11	7½%	Do. A Ord. Stk.	154—159	94—99	..
244,200	"	"	8	5½%	Bristol 5 p.c. max.	..	..	..
933,500	Stk.	—	5	5%	British	44—45	30½—31½	..
590,000	20	Mar. 26	12½	10%	Do. 4 p.c. Deb. Stk.	88—90	63—65	..
120,000	Stk.	June 27	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—58	..
245,771	"	"	4	4%	CapeTown & Dis., Ltd.	1½—2½	6⅛—6⅝	6⅜—6½
100,000	10	—	—	—	Do. 4½ p.c. Pref.	4—6	7—7½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Deb. Stk.	70—75	61—66	..
100,000	Stk.	June 27	4½	4½%	Chester 5 p.c. Ord.	108—110	..	..
157,150	"	Feb. 26	5	5%	Commercial 4 p.c. Stk.	106—108	61—64	61½
1,518,280	"	Feb. 12	5/9/4	80/-	Do. 3½ p.c. do.	103—105	58—61	..
560,000	"	"	5½	26/3	Do. 3 p.c. Deb. Stk.	69½—71½	50—52	..
475,000	"	June 11	3	3%	Continental Union Ltd.	76—79	45—50	45
800,000	"	"	4	—	Do. 7 p.c. Pref.	115—118	70—75	..
200,000	"	"	7	—	Croydon A 10 p.c.	..	155—165	..
51,600	Stk.	Aug. 29	14½	12½%	Croydon B and C 7 p.c.	..	130—135	..
278,400	—	"	11½	9½%	Derby Con. Stk.	128—125	..	..
499,370	Stk.	—	6	6½%	Do. Deb. Stk.	102—104	..	..
55,000	"	"	4	4%	European, Ltd.	17½—18	14½—15½	..
1,009,180	10	July 29	10	5/0	Gas Light and Coke { 4 p.c. Ord.	98—102	57—59	57½—58⅜
16,298,975	Stk.	Feb. 10	4/17/4	80/-	{ 3½ p.c. max.	76—79	53—55	53—54½
2,600,000	"	"	3½	26/8	{ 4 p.c. Con. Pref.	96—99	70—72	71
4,069,385	"	"	4	4%	{ 3 p.c. Con. Deb.	73½—74½	53—55	55
4,674,350	"	June 11	3	3%	{ 10 p.c. Bonds	..	..	..
180,000	"	"	10	10%	Hastings & St. L. 5 p.c.	..	59—64	..
82,500	"	Mar. 13	5	4½%	Do. 3½ p.c	37—39	44—49	..
258,740	"	—	3½	2⅜%	Hongkong & China, Ltd.	16½—16¾	7—8	..
70,000	10	April 29	11	7%	Hornsey 7 p.c.	..	115—120	..
86,600	Stk.	Sept. 12	9	8½%	Ilford A and C.	151—154	90—95	..
131,000	"	Mar. 19	7½	5½%	Do. B	115—118	69—74	..
65,780	"	"	6½	4½%	Do. 4 p.c. Deb.	92—94	61—64	..
65,500	"	June 27	4	4%	Imperial Continental	150—160	137—142	138—143
4,940,000	"	May 14	9	4½%	Do. 3½ p.c. Deb. Red.	84—86	79—81	..
1,385,000	"	Feb. 12	8½	3½%	Lea Bridge Ord. 5 p.c.	119—121	90—95	..
336,242	"	Mar. 12	6½	6½%	Liverpool 5 p.c. Ord. {A	211—213	..	..
2,498,905	"	Feb. 26	10	42/6	{B	146—148	..	..
806,068	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	..
165,736	"	Feb. 17	7/5/6	3½%	Maidstone 5 p.c.	..	58—63	..
75,000	5	June 11	6	3%	Malta & Mediterranean Mut. of Melbourne { 4½ p.c. Deb.	4½—4⅝	3½—3⅝	..
350,000	100	April 1	4½	4½%		99—101	90—97	..
541,920	20	May 19	4	5%	Monte Video, Ltd.	11½—13	13—14	13/0/9
1,875,892	Stk.	July 29	4½	3½%	Newcastle&Gatsh'd Con.	98½—99½	65—67	..
529,705	"	June 27	3½	3½%	Do. 3½ p.c. Deb.	87—88	56—58*	..
15,000	10	Mar. 13	—	11%	North Middlesex 10 p.c.	..	13½—14	..
55,940	10	"	7/14/0	7%	" " 7 p.c.	14—15	9½—9¾	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	101—104	102
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	4⅜—5½	..
60,000	50	Feb. 26	13	7½%	Portsea, Island B	125—131	76—81	..
100,000	50	"	12	6½%	Do. C	118—121	68—63	..
949,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅞—2½	36/10½—42/6
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4⅝—5	3½—3⅞	65/ —72/6
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—98	71—73	..
600,000	Stk.	July 31	4	4%	Do. " " 1911	..	49—52	..
846,198	"	June 27	4	4%	River Plate 4 p.c. Deb.	85—87	49—52	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	7½—8	7⅝
125,000	50	July 2	5	5%	{ 5 p.c. Deb.	47—49	40—45*	..
135,000	Stk.	Mar. 12	10	5%	Sheffield A	228—234	82—86	..
209,984	"	"	10	5%	Do. B	228—234	82—86	..
523,500	"	"	10	4½%	Do. C	220—222	71—74	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	June 27	9	10%	South African.	10½—11½	12½—13½	..
6,609,895	Stk.	Feb. 10	5/4/0	80/-	South Met. 4 p.c. Ord.	111—118	55—60	55—59⅜
250,000	"	July 12	—	5%	Do. Pref.	..	96—98	..
1,895,445	"	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	54—56	..
224,820	"	Feb. 26	8½	5½%	South Shields Con. Stk.	157—159	99—101	..
962,795	"	"	6	3⅞%	S'th Suburb'n Ord. 5 p.c.	114—116	76—79	78
187,558	Stk.	June 27	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—91	..
647,740	"	May 14	7½	3%	Southampton Ord.	99—102	67—69	..
121,975	"	June 27	4	4%	Do. 4 p.c. Deb. Stk.	..	63—65	..
120,000	"	Feb. 12		4½%	Tottenham District { A 5 p.c.	135—138	90—95	..
762,975	"	"	6	3%	{ B 3½ p.c.	115—117	63—66	64½
181,255	"	June 26	4	4%	{ 4 p.c. Deb.	87—89	64—66	..
183,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
293,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109	83—85	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	"	Feb. 26	8⅞	55/-	Wandsworth A 5 p.c.	151—155	88—93	..
255,638	"	"	6⅞	40/-	Do. B 3½ p.c.	129—134	68—73	..
108,075	"	"	—	38/6	Do: C	..	68—73	..
140,365	"	"	—	38/6	New Ordinary	..	68—73	..
353,000	"	"	6½	33/9	Wimbledon 5 p.c.	117—122	63—73	..
98,000	"	"	6⅞	40/-	Epsom 5 p.c.	121—126	70—75	..
88,416	"	June 27	3	3%	3 p.c. Deb. Stk.	66—69	49—61	..

* Ex Div.

Gas Poisoning Cases at Halifax.—Mrs. Hannah Mary Whiteley, of Halifax, wife of a master painter, was found last week dead on the bed, her head covered by blankets and a tube in her mouth the other end of which was connected with the gas-bracket, with the tap turned on at full. At the inquest, the jury returned a verdict of "Suicide by gas poisoning while of unsound mind." A verdict of "Suicide by gas poisoning while suffering from cancer" was returned at an inquest at Halifax last week, on Gertrude Sands, who was found dead in bed, with a blanket over her head and a pipe from the gas-bracket near her mouth.

The Warrington Gas Undertaking.—The Gas Committee of the Warrington Town Council, at a meeting on Tuesday last, submitted a recommendation that application be made to the Local Government Board for an increase of 25 p.ct. in the statutory charges for gas. The Chairman of the Gas Committee (Mr. Locker) said there was a net profit on the undertaking last year of £3536. At the moment, however, they could see ahead of them about £6400 in extra wages as compared with 1918. Rates and income-tax each showed an advance of £2000, while there was a prospective increase in the price of coal. The £3000 which they had to the good at the end of last year was wiped out in the first quarter of the present year. The Gas Committee's minutes were approved. It was also decided by the Council to apply for fresh borrowing powers.

Salford Gas-Works Coal Supplies.—At last week's meeting of the Salford Town Council, the Gas Committee asked the Council to accept the offer of three firms for the supply altogether of 33,000 tons of coal. Alderman Phillips informed Mr. Royle that tenders had not been advertised as usual as they were advised by the Coal Controller that the same firms would supply them in the ensuing year, in the same quantities, as far as possible, and on the same terms and conditions as last year. Mr. Royle thought this was carrying on business on the wrong lines, and their standing orders should be adhered to. The Electricity Committee advertised for supplies, and why the Gas Committee did not do the same he did not know. Alderman Phillips replied that it would simply have been a waste of money. The proposal of the Gas Committee was then agreed to.

The Directors of the Midleton (co. Cork) Gas Company have declared a dividend of 8 p.ct. as against 7½ p.ct. last year.

A new company has been registered under the title of Davison and Partner, Ltd., to carry on the business of engineers. The capital is £25,000, in £1 shares.

Messrs. Bale and Hardy, Ltd., have received orders for Tully's carburetted hydrogen plants for Heywood (300,000 c.ft. per day capacity), Irthlingborough (100,000 c.ft.), and Freshwater (75,000 c.ft.).

At the last meeting of the Lymm (Cheshire) Urban District Council, it was recommended that counsel's opinion be taken with regard to compensation for the Council for the sinking of gas and water mains, as a result, it was alleged, of the action of the salt-works. After discussion, the matter was referred back for further consideration.

At their meeting last week, the Halifax Town Council decided to grant, as from March 14 last, an increase in war bonus of 5s. per week to male employees over 18 years of age, and of 2s. 6d. to males under that age, except in cases in which such employees are covered by national awards. Female employees not subject to national awards are to get an advance of 2s. 6d. per week. The matter affects about 15 p.ct. of the Corporation workers, and brings the men's payment to 35s. per week above pre-war rates.

Over 200 employees from all departments of the Bristol Gas Company assembled, under the Chairmanship of the Secretary (Mr. S. E. Halliwell), supported by the Engineer (Mr. R. Robertson), and other officials, to hear a lecture by Mr. Frederick Dye, on the application of the gas-boiler to domestic tap supply. The lecturer went fully into the gas-heated circulating boiler,, dealing first with the subject of cost, and then with the technical aspects of the question. He concluded by describing to his audience how they could inexpensively construct a complete model hot-water apparatus in glass tube, so as to see the phenomena of circulation, the actions which occur where taps are used, and other points which go to make success or failure. It is a means of obtaining an inner knowledge of the subject in a highly interesting way.

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